CROP LOSS FROM AIR POLLUTANTS ASSESSMENT PROGRAM

Interim Report

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CALIFORNIA AIR RESOURCES BOARD

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CROP LOSS FROM AIR POLLUTANTS ASSESSMENT PROGRAM - INTERIM REPORT

E R R A T A

p. ii, Lines 18 and 19, and p. xiii, lines 9 and 11, 7% should be 6%

p. 28, Equation 6, the blank should be #1

p. 53, Table 18, yield loss for corn-sweet should be 6.1%

p. 67, Numbers for references #10 and #11 were reversed. Heagle et al. 1979 should be #10, Heagle et al. 1986 should be #11

ABSTRACT

The Statewide Air Pollution Research Center (SAPRC) with funding by the California Air Resources Board (CARB) has developed a comprehensive program to assess the yield losses to California crops from air pollutants. Research during the past year has focused on preparation of a comprehensive assessment of yield losses to California Crops from ozone using 1984 as a target for analysis. A literature search indicated ozone dose-yield loss equations for 19 of the 52 crops in the California Agricultural Resources (CAR) Model. A crop data base was constructed containing crop yield, acreage, growing season, and location information by county and crop. An air monitoring data base was constructed containing hourly ozone data for each site in California, and dose information for air monitoring sites and time periods corresponding to the location and growing season of each crop in each county. Three ozone doses were calculated to correspond to growing season data required by the individual crop loss models: hours x pphm > 10 pphm, 7-hr seasonal average between 0900-1559, and 12-hr seasonal average between 0800-1959.

Nine crops were calculated to have losses of greater than or equal to 7% as compared to the potential yield at a background concentration of 2.5 pphm: alfalfa hay - 9%, dry beans - 23%, sweet corn - 7%, cotton - 20%, grapes - 21%, lemons - 28%, onions - 23%, oranges - 19%, and rice - 10%. Ten crops were calculated to have little yield loss (≤5%): barley - 0%, grain-corn - 2%, lettuce - 0%, corn silage - 5%, sorghum - 0%, spinach - 0%, strawberries - 0%, sugar beets - 0%, fresh tomatoes - 3%, processing tomatoes - 5%, and wheat - 2%. Of the remaining 33 crops in the data base 16 are at potential risk and 14 are not at risk from ozone as determined by the crops occurrence, or non-occurrence, respectively, in geographical areas where or seasons when ozone is >5.0 pphm. Three "crops" are difficult to assess because they actually contain a large number of species: i.e., nursery, greenhouse, and miscellaneous vegetable crops. The yield losses will be used for economic analysis by researchers at the University of California at Davis.

TABLE OF CONTENTS

TABLE OF CONTENTS
(concluded)

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DISCLAIMER

The statements and conclusions in this report are those of the contractor and not necessarily those of the California Air Resources Board. The mention of commercial products, their source or their use in connection with material reported herein is not to be construed as either an actual or implied endorsement of such products.

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES
(concluded)

SUMMARY AND CONCLUSIONS

California is the number one agricultural state in the country with over 30 major crops for a total valuation of over $10 billion in 1984. California also has some of the most severe air pollution conditions in the United States, with the word "smog" originally coined to describe the mixture of photochemical pollutants found in the South Coast Air Basin. Historically there have been several attempts to evaluate the impact to agriculture from California air pollution, ranging from field surveys to sophisticated field, greenhouse, or laboratory experimental studies. Direct impacts to California crops have been shown, but only limited attempts have been made to synthesize the large amount of research information into a form useful to state policy makers and agriculturalists.

Studies in the 1950's and 1960's utilized field surveys to estimate crop losses primarily from oxidants, the major form of California pollution. These were subjective estimates by experienced observers or empirical predictions based on injury in the field. Calculated losses for California varied widely from $11 to $55 million dollars depending on the year. While providing estimates for a few crops, those assessments were generalized assumptions that may not hold for all species and could not consider crop losses not associated with visible injury.

Recently researchers have begun to evaluate the overall process and assumptions involved with assessing crop losses from air pollutants. For National Crop Loss Assessment Network (NCLAN), various exposure-response functions and economic models are being tested to pick the best forms for predicting nation-wide crop losses. However, no such effort is being made to address assumptions and models most relevant to California.

Thus, to provide much needed information concerning integrated assessments of the losses to crops from air pollutants in California, the CARB initiated a Crop Loss Assessment Program in January 1985. Phase I of the program included establishment of a comprehensive computer literature data base on air pollutant effects to vegetation, a critical review of key studies on air pollution to California crops in the field, and convening of an intensive workshop to address current data and information gaps for a program to address crop losses in California. Phase I of the program was funded through a contract to the Statewide Air Pollution Research

Center of the University of California, Riverside, for the period of January 17, 1985 through July 29, 1986 for the research portion of the contract. Drs. C. Ray Thompson and David M. Olszyk were Principal Investigator and Co-Investigator, respectively.

Phase II involved implementation of the recommendations from the Crop Loss Workshop. The four tasks were as follows:

(1) Critically surveyed published ozone dose-plant response data for California crops at risk to air pollutants. This survey included data base development and review of statistical procedures used in data analysis. This literature survey also identified gaps in current knowledge of sensitivity of crops at risk and environmental factors affecting sensitivity. The information gained was forwarded to the CARB to assist in planning future research.

(2) Determine location of crops at risk based on regional and county data for crop production. The crop production data were supplied by Dr. R. G. Howitt of the Department of Agricultural Economics, University of California, Davis.

(3) Determine air monitoring site locations and averaging time periods (e.g., 12 hours per day, 7 hours per day, hours >10 pphm) for summarization based on data obtained from the ARB Aerometric Data Division. Data from 1984 were used for an initial run of the crop loss model.

(4) Use appropriate crop dose response data and ozone dose to determine indexes of loss from ozone for each crop in each region of California. These indexes will be given to the CARB Research Division for economic analyses research projects.

Much of the research during the past year involved manipulation of three data bases containing information on crops, air monitoring data, and loss calculations. The crop data base included literature on yield and growth effects from ozone, injury effects from ozone, and mechanisms of action for ozone/field indicators of stress. It also included numerical data from the California Agricultural Data Base for 1958-84. It contained data for 50 crops by county, including acreages, production, and value. Months for the growing season and peak sensitivity period per crop per county, were obtained from Statewide Agricultural Extension personnel and county farm advisors. Location of crops in the county was determined with CDFA dot maps and conversations with cooperative extension personnel and farm advisors. The data base also included crop loss model equations for 20 crops based on information available in the published literature and current research. Some models were reconstructed based on past air monitoring data. All models were modified to generate 0-1.0 index, and based on 0.025 ppm (for 7- or 12-hr averages), or 0 hours (for hrs x pphm > 10 pphm dose) as background ozone levels. There were no models for 30 crops.

The air monitoring data base was constructed using the CARB data base for 1962-1985. It includes hourly ozone averages for each site in the state for each year. The early data were corrected for differences in calibration between sites. The preliminary crop loss analysis used ozone data for 1984 based on hourly values obtained from the ARB Aerometrics Division. Urban sites were not included in the analysis unless they were the only sites available in a county. Rural air monitoring site(s) for ozone exposure for each crop in each county were selected, with nearest air monitoring sites to crop's location used wherever feasible. Specific sites were used for entire counties in most cases unless specific crops could be associated with certain air monitoring sites as in Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, and Ventura counties. Monthly averages were calculated for the three most common ozone parameters: hours x pphm for pphm >10, 7-hr average between 0900-1559 PST, and 12-hr average between 0800-1959 PST. Monthly averages for three parameters were determined for 1981-1984 for all sites. Data also were obtained for selected sites in various years to correspond to yield response data for a variety of crops in order to calculate ozone exposure parameter-yield response equations.

The air monitoring data base also included the calculated 10 pphm dose or, 7- and 12-hr averages for each crop in each county for growing season of crop. If more than one site was used, the calculated averages considered the number of hours of ozone data for each site. If one of the sites had data from more than one month missing for the season, it was not used and data from the next nearest air monitoring site was used. The loss calculation data base integrated all published ozone exposure-yield response equations for field exposures, preferable in California. Ozone data were run through equations for each crop in each county to obtain a predicted % yield loss compared to a 'base' i.e., 'background' ozone concentration. The county-by-county potential yields were than summed and the total actual yield divided by total potential yield to obtain the statewide index of loss for the crop. If no dose-response equation was available for a crop the county yield loss was 0%, and statewide % yield loss was 0.

Based on the information in all the data bases, nine crops were calculated to have yield losses of 7% or more as compared to the potential yield at a background concentration of 2.5 pphm: alfalfa - 9%, dry beans - 23%, sweet corn - 7%, cotton - 20%, grapes - 21%, lemons - 28%, onions - 23%, oranges - 19%, and rice - 10%. Ten crops were calculated to have little yield loss (≤5%): barley - 0%, grain-corn - 2%, lettuce - 0%, corn silage - 5%, sorghum - 0%, spinach - 0%, strawberries - 0%, sugar beets - 0%, fresh tomatoes - 3%, processing tomatoes - 5%, and wheat - 2%. Of the remaining 33 crops in the data base, 16 are at potential risk and 14 are not at risk from ozone as determined by the crops' occurrence, or non-occurrence, respectively, in geographical areas or seasons when ozone is >5.0 pphm (at risk), or <5.0 pphm (not at risk). The yield loss estimates decrease as the assumed background level increases. The yield losses will be used for economic analysis by researchers at the University of California at Davis.

This preliminary study was the first to make consider of all available information to assess yield losses from ozone in California. Some additional strengths of the study were: i) use of data only from controlled experiments where both crop yield and ozone exposure could be determined for particular group of plants, ii) inclusion of data only from studies conducted in the field under field cultural conditions and environments, iii) use of data generated in California, under California growing conditions for all but four crops, iv) consideration of county-by-county crop growing seasons and ozone exposures, v) inclusion of ozone exposure data to calculate loss equations for crop studies where ozone data were not available previously and vi) comparison of estimated losses for crops with multiple loss equations. Limitations of the study which need additional consideration were: i) use of the 2.5 pphm 'base' to estimate losses from potential production for all counties in the state,

ii) lack of ozone data for many rural agricultural counties, iii) use of counties as the smallest unit for estimating ozone concentrations and crop production, iv) assumptions required to generate yield loss equations for crops where ozone exposure had to be determined "after the fact" based on outside ozone data from the nearest air monitoring site, v) use of a single equation for all cultivars of a crop, vi) lack of consideration of effects of any other environmental or biological factors on crop yield, or effects of those factors on plant response to ozone, and vii) generation of ozone exposure-yield loss equations based only on essentially two points: filtered and ambient air.

Conclusions

1. There are sizeable yield losses to nine important California crops from ozone, based on 1984 air monitoring data.

2. An additional 15 crops are at risk from ozone due to elevated concentrations of ozone both in the geographical area and season where the crops are grown, however no dose-response information is available for these crops.

3. Twenty-seven crops are not at risk due either to low yield losses predicted from the crop loss equations, or non-occurrence in geographical area, or season where or when ozone concentrations are high.

4. The crop loss estimates based on different equations for the same crop are surprisingly similar, especially for cotton and alfalfa.

5. The equations using hours x pphm >10 pphm as a cumulative indicator of dose produce loss estimates much different than 7- or 12-hr average equations. Ozone patterns with many high peak values are representative only of the South Coast Air Basin, and not of the current primary agricultural areas of the state. These areas (e.g. San Joaquin Valley) have relatively high mean concentrations but few peaks > 10 pphm. Ambient ozone definitely is affecting crop yields in the San Joaquin Valley, based on field research conducted at Parlier and Shafter. Thus the growing season average and not the peak ozone values > 10 pphm may be more important in affecting crop yield in the San Joaquin Valley and other areas of California. Thus, 10 pphm dose equations are not used for modeling losses unless they are the only source of information.

6. The crop loss estimates are only as accurate as the input data and assumptions. More information is especially needed regarding: ozone data in the San Joaquin Valley, Imperial Valley, Salinas Valley, and other agricultural areas; ozone exposure-yield response models for tree fruit crops; peak time period for sensitivity of crops to ozone; and different way to express ozone exposure.

7. The crop loss estimates are greatly affected by assumed background ozone concentration and ambient ozone concentration as modeled to reflect proposed ozone standards.

8. According to the Crop Loss Assessment Program, enough information exists concerning losses from major crops to initiate modeling of economic losses associated with yield losses.

RECOMMENDATIONS

The project was assessed following the year of work on the project, and with the suggestions of attendees of the crop-loss "mini" workshop. The following recommendations would allow for more effective and efficient review of crop losses in California:

1. Prepare a revised preliminary statewide assessment for crop loss from O_3 in 1984 based on suggestions from the June 1986 "mini" workshop. A computer tape of the preliminary loss estimates would be forwarded to Dr. Dick Howitt of U.C. Davis to begin the economic analysis.

2. Contact key county agricultural commissioners and farm advisors to discuss and refine the county-by-county crop production assumptions used to calculate the estimated yield losses.

3. Update the 1984 assessment based on all new available information. The crop loss estimates would be determined for a series of base ozone concentrations and not just 2.5 pphm. The updated 1984 assessment would form the basis for a peer-reviewed paper to be submitted to the Journal of the Air Pollution Control Association or other appropriate journal.

4. Establish the data base management procedures so that future assessments can be efficiently and rapidly produced.

5. Modify future assessments based on environmental conditions in different areas of California.

Recommendations 1-5 would be addressed by research tasks in a new contract for the Crop Loss Assessment Program. Additional recommendations that could be addressed in other research projects include:

6. Establishment of additional ozone air monitoring sites to characterize ozone concentrations in the San Joaquin and Sacramento Valleys.

7. Initiation of a field study to document ozone concentrations injurious to important California fruit and nut tree crops. The study would determine general responses of trees to air pollutants applicable to many tree crops. The field study would use a chamber-less open-air release exposure system or other appropriate technology at a site in a tree crop growing area.

8. Provide information for analysis of the economic impact of crop losses from ozone, to be carried out by Dr. Richard Howitt, U. C. Davis.

I. INTRODUCTION

California is the number one agricultural state in the country with over 30 major crops for a total valuation of over $10 billion in 1984 (7). California also has some of the most severe air pollution conditions in the United States, with the word "smog" originally coined to describe the mixture of photochemical pollutants found in the South Coast Air Basin. Historically there have been several attempts to evaluate the impact to agriculture from California air pollution, ranging from field surveys to sophisticated field, greenhouse, or laboratory experimental studies. Direct impacts to California crops have been shown, but only limited attempts have been made to synthesize the large amount of research information into a form useful to state policy makers and agriculturalists.

Studies in the 1950's and 1960's utilized field surveys to estimate crop losses primarily from oxidants, the major form of California pollution, based on subjective estimates by experienced observers or empirical predictions based on injury in the field (2,23,24). Calculated losses for California varied widely from $11 to $55 million dollars depending on the year. While providing estimates for a few crops, those assessments were based on generalized assumptions that may not hold for all species and could not consider crop losses not associated with visible injury.

More recent studies have focused on estimates of economic yield losses based on experimental field studies where the pollutant levels can be controlled and/or monitored, and where plant response could be carefully measured. The California Department of Food and Agriculture's (CDFA) California Crop Loss Assessment (CCLA) project has developed from the original field survey approach (22). The CCLA sponsored large scale pollutant gradient studies with plants grown in standardized media and containers were grown at locations where ambient air pollutant monitoring indicated a gradient in ambient ozone concentrations. These studies generated dose-response equations for crops such as tomatoes and alfalfa relating ambient ozone concentrations to yield losses after environmental variation in air temperature and relative humidity along the gradient had been considered statistically (27,28). Current CCLA activities continue to emphasize experimental research to generate data for ozone dose-response equations for California crops using closed-top field chambers (22). All of the equations generated are designged to predict only yield losses from ambient ozone data, no acreage or monetary losses are determined.

The National Crop Loss Assessment Network (NCLAN) funded by the United States Environmental Protection Agency focused on standardized experimental research using open-top field chambers to generate economic crop loss models. The NCLAN research was at five sites, one in the southern San Joaquin Valley of California, and four in midwestern and eastern states. Researchers for NCLAN have generated economic loss equations for at least 10 crops, with data for 5 crops (i.e., alfalfa, cotton, barley, lettuce and tomato) obtained at California sites (1,12-15,18-21,29-32). The NCLAN project is geared to establishing crop loss projections for the entire United States. Thus, exposure-response data for the more humid, natural rainfall eastern sites may not be readily transferable to the low humidity-irrigated agriculture prevalent in California. In addition, the NCLAN project is terminating all field research after the summer of 1986, including that in California. Thus, there may be no future federal research efforts specifically applicable to air pollution effects on crops in California.

The California Air Resources Board (CARB) also has carried out an extensive extramural research effort to determine losses to important California crops from air pollutants. The field research has focused on two sites: the University of California Kearney Field Station at Parlier in Fresno county and University of California at Riverside. The studies have focused on the effects of ozone and sulfur dioxide air pollution on important San Joaquin Valley crops: cotton (6), alfalfa (4), sugar beets (3), grapes (5), and tomatoes (study underway). Recent Riverside studies have focused on the effects of ozone and sulfur dioxide on alfalfa (25, lettuce (26), wheat (26), rice (16), and Valencia oranges (17). The CARB studies have focused on growth and yield losses from air pollutants, but have not attempted to relate site specific losses to statewide losses based on statewide air pollutant levels.

Neither the CCLA, the NCLAN, nor the CARB projects in California have attempted to integrate other published field results into their crop loss models. Furthermore, none of the studies attempted to validate the crop loss models based on even limited scale using field surveys of occurrance injury symptoms in different areas, or by examining ozone levels and area-specific yield data.

Recently researchers have begun to evaluate the overall process and assumptions involved with assessing crop losses from air pollutants (14,15). For NCLAN various dose-response functions and economic models are being tested to pick the best forms for predicting nation-wide crop losses. However, no such effort is being made to address assumptions and models most relevant to California. California has over 52 major crops, with no single crop accounting for more than 11% of the total value of all crops. This diversity is not present for the U.S. as a whole where corn, soybeans, and wheat make up a large portion of the value of all crops. Thus many crops, e.g., fruit and vegetable crops, important in California have not been addressed by the NCLAN research. California crops also are grown under irrigation and in a dry climate, conditions not typical for most other U.S. agricultural areas. The effects of irrigation and low humidity on crop sensitivity to air pollutant in the field have not been clearly defined. However, laboratory research demonstrated that environmental factors such as water stress, and humidity may alter the sensitivity of plants to air pollutants (38). Thus crop loss data generated in other areas of the United States may not be applicable to California.

Thus, to provide much needed information concerning integrated assessments of the losses to crops from air pollutants in California, the CARB initiated a Crop Loss Assessment Program in January 1985 (Figure 1). Phase I of the program included establishment of a comprehensive computer literature data base on air pollutant effects to vegetation, a critical review of published literature on key studies of air pollution to California crops in the field, and convening of an intensive workshop to address current data and information gaps for a program to address crop losses in California.

Phase I of the program was funded through a contract to the Statewide Air Pollution Research Center of the University of California, Riverside, for the period of January 17, 1985 through July 29, 1986 for the research portion of the contract. Drs. C. Ray Thompson and David M. Olszyk were Principal Investigator and Co-Investigator, respectively.

<-FORMATION-----DATA BASE MANAGEMENT------UP-DATES->

INITIAL WORKSHOPS FOLLOW-UP

< * * * * * >

<------------INITIAL--LOSS ESTIMATES--UP-DATES----->

<------------PILOT RESEARCH------------->

<-FIELD INJURY EVALUATION-->

<---INFORMATION DISSEMINATION----->

+	+	+	+	+	+
1/85	1/86	1/87	1/88	1/89	1/90

Figure 1. Time line for tasks of crop loss assessment program.

Phase II involved implementation of the recommendations from the Crop Loss Workshop. Drs. C. Ray Thompson and D. M. Olszyk, Principal Investigator and Co-Investigator, respectively, were awarded a contract to carry out the recommendations during the period of July 30, 1985 through July 29, 1986. As a first step, a meeting was held in Sacramento to discuss the recommendations between Drs. Thompson and Olszyk and members of the CARB staff on August 19, 1985. Meetings were held with Drs. John Holmes, Stan Dawson and Homero Cabrera, Ms. Sylvia Champomier and Mr. C. D. Unger of the CARB Research Division. Meetings were also held with Mr. Jim Fries, Mr. Fred Granham and Mr. John Kinney of the CARB Aerometric Data Division, and Dr. R. E. Howitt of the Agricultural Economics Department, University of California, Davis.

During the meetings, SAPRC staff, in conjunction with CARB staff, developed a framework for the next phase of the California Crop Loss Assessment Program. The four tasks were as follows:

(1) Critically surveyed published ozone exposure-plant response data for California crops at risk to air pollutants. This survey included data base development and review of statistical procedures used in data analysis. This literature survey also identified gaps in current knowledge of sensitivity of crops at risk and environmental factors affecting sensitivity. The information gained was forwarded to the CARB to assist in planning future research.

(2) Determined location of crops at risk based on regional and county data for crop production. The crop production data were supplied by Dr. R. G. Howitt of the Department of Agricultural Economics, University of California, Davis.

(3) Determined air monitoring site locations and averaging time periods (e.g., 12 hours per day, 7 hours per day, hours >10 pphm) for summarization based on data obtained from the ARB Aerometric Data Division. Data from 1984 were used for an initial run of the crop loss model.

(4) Used all appropriate available crop response and ozone exposure data to determine indexes of loss from ozone for each crop in each region of California. The indexes based on available published literature will be given to the staff of the University of California, Davis, Department of Agricultural Economics for economic analysis.

Phase III of the study will involve efforts to verify the crop loss estimates through small scale experiments in selected areas of the state, regular meetings with county and statewide agricultural officials to discuss the results of the annual assessments of crop loss from O_3, experimental work to assess and implement methods for assessing potential field losses during a growing season, to interface crop loss estimates with economic models, and to continually upgrade the crop loss data bases and issue yearly crop loss assessments. The field exposure portion of the study would potentially involve location of portable tubular air exclusion ducts at selected sites to blow filtered vs. ambient air over crops during the growing season (33). These exposures will indicate potential areas where O_3 is affecting crop yield for comparison with predicted yield losses based on air quality data. Phase III of the study will run from approximately January 1987 through July of 1989.

A. Statement of the Problem

Until the inception of the CARB Crop Loss Assessment Project, there had been no recent effort to evaluate statewide losses to all crops and economic effects from air pollutants in California despite the continuing high levels of the pollutants and advances in scientific methodology for assessing plant responses in the field. Neither the United States Environmental Protection Agency sponsored National Crop Loss Assessment Network nor the California Department of Food and Agriculture's California Crop Loss Assessment program was geared toward producing comprehensive yield loss estimates for economic evaluations of air pollution induced crop losses in California. Even though obvious air pollution symptoms occur in California, there was no program to systematically evaluate air pollution effects to provide information for real-time crop loss assessments. The comprehensive CARB Crop Loss Assessment Project will considerably advance efforts to address current knowledge, identify information needed, develop predictive models, develop field methods for assessing air pollutant injury and gain accurate field data relative to crop losses from air pollutants in California. Additional research is needed to develop the project and make the information generated available to agricultural officials, administrators, growers, and the public.

B. Objectives

The primary objective of the crop loss program is to evaluate current crop losses from air pollutants in California. The program focuses on horticultural and agronomic crops. All of the crop data used have been available to any researcher. Much of the data has already been published in peer reviewed literature, and the remaining information is included in reports or is in the process of being prepared for publication.

Subordinate objectives include:

(1) Develop data base on responses of California crops to air pollutants based on current pertinent literature.

(2) Review existing models for crop loss and develop and extend those models for California crops.

(3) Identify scientific information gaps in plant response model which require additional experimental work.

(4) Review existing, and develop new procedures for field observation of losses.

(5) Evaluate and conduct pilot research on a variety of physiological or biochemical indicators of crop loss from air pollutants in addition to visible injury symptoms.

(6) Assist local agencies' personnel in recognizing and reporting plant damage from air pollutants.

(7) Organize meetings in different regions of California to present information.

(8) Provide estimates of crop damage for different regions of California based on field observations, air quality, and crop yield loss models.

(9) Prepare annual reports of crop loss estimates for use by CARB in regulatory proceedings or other uses.

II. PROGRESS DURING CONTRACT PERIOD

Much of the research effort during the past year involved literature review, data entry, and aspects of data manipulation to initiate the process of providing computer projections of losses to California crops from ozone.

A. Crop Data Base Management

1. Literature Data Base

This data base included literature in yield and growth effects from ozone, injury effects from ozone, and mechanisms of action for ozone/field indicators of stress.

2. Crop Production Data Base

This data base includes numerical data from the California Agricultural Data Base for 1958-84. It contains data for 52 crops by county, including acreages, production, and value. Months for the growing season and possible ozone peak sensitivity period when plants are actively growing per crop per county, were obtained from Statewide Agricultural Extension personnel and county farm advisors. The location of crops in the county was determined with CDFA dot maps and conversations with extension personnel, and farm advisors. Appendix A includes the acreages, tonnage, and growing season for each crop in each county of California.

3. Crop Loss Model Data Base

This data base includes crop loss model equations for 20 crops based on literature and current research (Table 1). Some models were reconstructed based on past air monitoring data. All models were modified to generate 0-1.0 index, and based on 2.5 pphm (0.025 ppm) or 0 hrs x pphm > 10 pphm as background ozone levels. There were no models for 32 crops (Table 2).

B. Air Monitoring Data Base

1. Monthly Averages Data Base

This data base was constructed using the CARB data base for 1962-1985. It included hourly ozone averages for each site in the state for each year. The early data were corrected for differences in calibration

Table 1. Crops With Ozone Exposure - Yield Response Equations[a]

Alfalfa (5)	Lemons	Spinach (2)
Barley	Lettuce (3)	Strawberries
Dry Beans (2)	Onions	Sugar Beets (2)
Corn-Field	Oranges (2)	Tomatoes Fr.
Corn-Sweet	Potatoes (2)[b]	Tomatoes Pr. (3)
Cotton (7)	Rice	Wheat (3)
Grapes (2)	Sorghum-Grain	

[a]Numbers of different yield loss equations in parentheses.
[b]Both 10 pphm and 12-hr average equations are available for potatoes. However, the data cannot be used for a statewide crop loss estimate as the study was not conducted under exposure conditions typical of the most important potato growing areas (see Section II.C.2.b. "Potatoes").

Table 2. Crops Without Ozone Exposure - Yield Response Equations

Almonds	Garlic	Peaches
Apples	Grain Hay	Pears
Avocados	Grapefruit	Pistachios
Brocolli	Honeydew Melons	Plums
Cantaloup Melons	Kiwi Fruit	Prunes
Carrot	Lima Beans	Safflower
Cauliflower	Nectarines	Silage
Celery	Oats	Sweet Potatoes
Cherries	Olives	Walnuts
Figs	Pasture	Watermelon

between sites. Monthly averages were calculated for the three most common ozone exposure parameters: hours x pphm for pphm >10, 7-hr average between 0900-1559 PST, and 12-hr average between 0800-1959 PST. Monthly averages for three parameters were determined for 1981-1984 for all sites, and for selected sites in various years to correspond to yield response data for a variety of crops for which ozone exposure-yield response equations were calculated.

2. Air Monitoring Sites Data Base

This data base included all air monitoring sites with ozone data for 1984 based on 1984 ARB Aerometrics Division Annual Summary (Figure 2). Urban sites were not included in the analysis unless they were the only sites available in a county. Rural air monitoring site(s) for ozone exposure for each crop in each county were selected, with nearest air monitoring sites to crop's location used wherever feasible (Table 3). Some rural sites were not used if only scattered months were available. Specific sites were used for entire counties in most cases unless specific crops could be associated with certain air monitoring sites as in Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, and Ventura counties. Appendix A indicates the air monitoring sites used for each crop and county to obtain ozone concentrations for the crop loss estimates.

3. Seasonal Exposure Data Base

This data base included the calculated 10 pphm, 7-hr, and 12-hr averages for each crop in each county for growing season of crop. If more than one site was used, the calculated averages considered number of hours of ozone data for each site. If one of the sites had data from more than one month missing for the season it was not used, and data from the next nearest air monitoring site was used. Appendix B includes the 10 pphm, 7-hr, and 12-hr averages for each crop in each county.

C. Integration and Crop Loss Index Presentation

1. Calculation of Yield Losses

The data base integration used published ozone exposure-yield response equations for field exposures, preferable in California. Ozone data was run through a series of equations for each crop in each county to obtain a predicted % yield loss compared to a 'base' i.e., 'background' ozone concentration (Table 4). The county-by-county potential yields were then summed and the total actual yield divided by total potential yield to obtain the statewide index of loss for the crop. If no ozone exposure-response equation was available for a crop the county yield loss index is 1.0, county % yield loss is 0, and statewide % yield loss is 0.

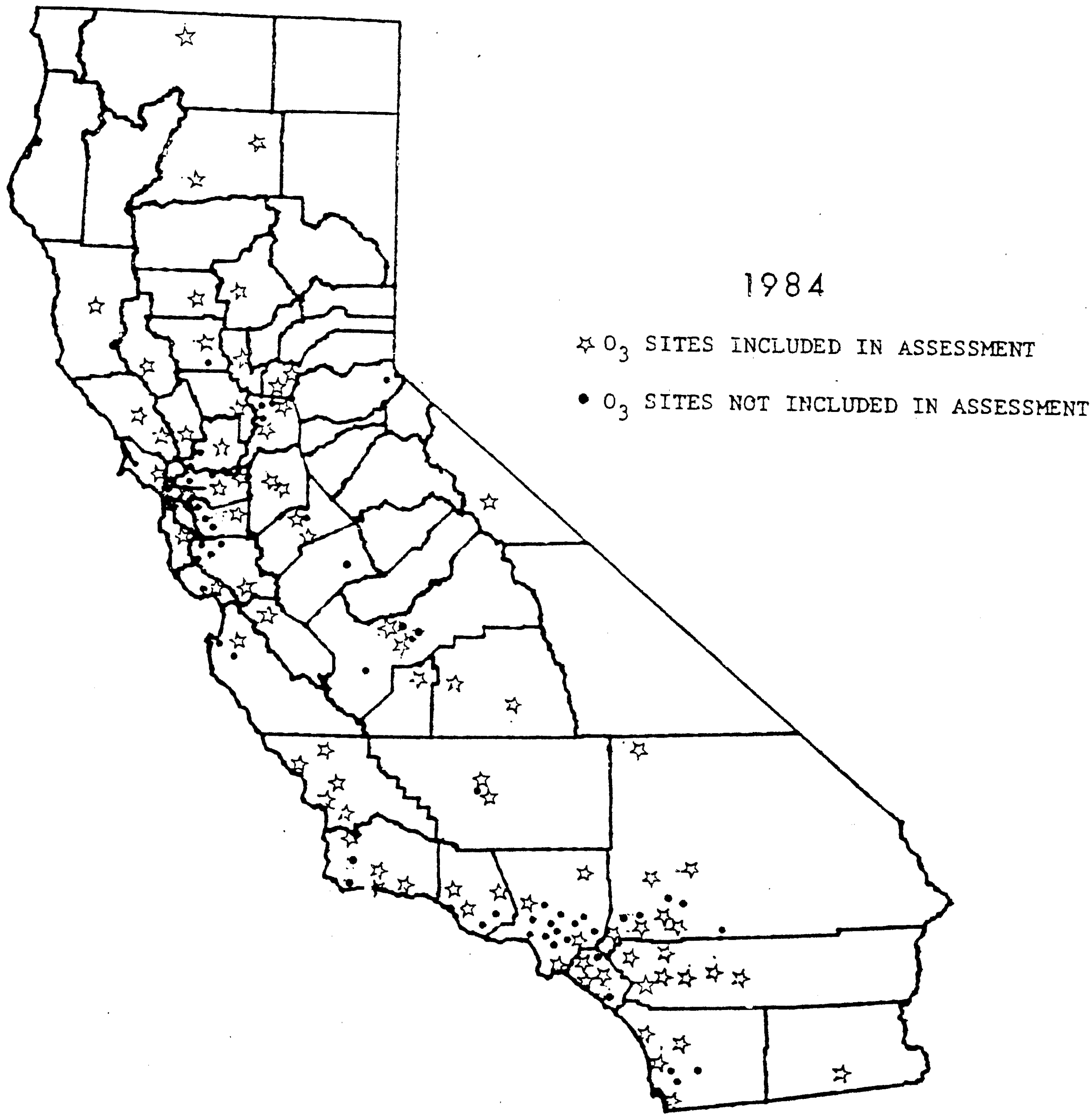

Figure 2. Ozone air monitoring sites in California for 1984.

Table 3. Ozone Air Monitoring Sites Used for 1984 Assessment and Assumptions Used to Choose those Sites

County	Site Name(s)	Assumption(s)
Alameda	Livermore	Agricultural area is in eastern rural part of the county.
Alpine	Mammoth Lakes	Nearest eastern mountain site.
Amador	Auburn	Used for mountain counties, assuming agricultural areas are on the west side exposed to central valley.
Butte	Manzanita	Nearest Sacramento Valley site.
Calaveras	Auburn	See Amador County.
Colusa	Fairgrounds	Data available only for summer growing season. Use Manzanita site if data are missing.
Contra Costa	Bethel Island Road	Most rural site, except use Concord when data are missing.
Del Norte	Yreka	Nearest site in northern California area.
El Dorado	Auburn	Nearest site.
Fresno	Herndon, Parlier Butler St., Cal. St.	Average sites on either side of Fresno metropolitan area. Use Butler St. and Cal. St. for 1983 citrus.
Glenn	Willows	Use Manzanita when data are missing.
Humboldt	Ukiah	Nearest site.
Imperial	El Centro	Indio nearest site for most of year when no data for El Centro.
Inyo	Mammoth Lakes, Trona	Average two nearest sites.
Kern	Edison, Oildale Chester St.	Average sites on either side of Bakersfield metropolitan area. Use Chester St. for 1983 citrus.
Kings	Hanford	-

(continued)

Table 3 (continued) - 2

County	Site Name(s)	Assumption(s)
Lake	Lakeport	-
Lassen	Yreka	Nearest site.
Los Angeles	Long Beach, Whittier, Lancaster, Newhall	Nearest site for each crop is used.
Madera	Turlock, Herndon	Average of two nearest sites.
Marin	San Rafael	-
Mariposa	Turlock	Nearest site.
Mendocino	Ukiah	-
Merced	Turlock	Nearest site.
Modoc	Yreka	Nearest site.
Mono	Mammoth Lakes	-
Monterey	Salinas	Only really rural site.
Napa	Napa	-
Nevada	Auburn	See Amador County.
Orange	El Toro, San Juan Capistrano, La Habra, Costa Mesa	Nearest site for each crop is used.
Placer	Rocklin, Auburn	Use average of sites.
Plumas	Auburn	See Amador County
Riverside	Indio, Hemet, Palm Springs, Indio, Rubidoux, Perris, Banning, Norco	Nearest site for each crop is used. Use Indio for Palos Verde area.
Sacramento	Meadow View, Folsom	Use either average of both sites or only Meadow View depending on location of crops. Other Sacramento sites are urban.

(continued)

Table 3 (continued) - 3

County	Site Name(s)	Assumption(s)
San Benito	Hollister	-
San Bernardino	Barstow, Trona, Victorville, Redlands, San Bernardino, Fontana, Chino, Upland	Nearest site for each crop used. Use Upland for 1983 lemons.
San Diego	Chula Vista, Escondido, Del Mar, Oceanside	Nearest site for each crop used.
San Francisco	San Francisco	-
San Joaquin	Hazelton, Mariposa	Average two sites.
San Luis Obispo	Paso Robles, Morro Bay, Nipomo, San Luis Obispo, Grover City	Nearest site for each crop used.
San Mateo	Redwood City	-
Santa Barbara	Goleta, Lompoc, Santa Ynez, El Captain Beach, Santa Maria, Vandenburg	Nearest site for each crop used.
Santa Clara	Gilroy	Only agricultural site, use Hollister if no data available.
Santa Cruz	Aptos	Agricultural site.
Shasta	Redding (Placer St.), Burney	Average of two sites.
Sierra	Auburn	See Amador County.
Shiskiyou	Yreka	Use for all northern counties.
Solano	Vacaville	Fairfield is more urban.
Sonoma	Sonoma, Santa Rosa	Average two sites.
Stanislaus	Turlock, Modesto	Average two sites.
Sutter	Yuba City	Use Manzanita if no data.

(continued)

Table 3 (concluded) - 4

County	Site Name(s)	Assumption(s)
Tehama	Redding, Burney, Manzanita	Average of nearest site depending on month.
Trinity	Ukiah	Nearest site.
Tulare	Visalia	Agricultural sites. Mountain View used for neighboring mountain counties.
Tuolumne	Turlock	Nearest site.
Ventura	El Rio, Piru, Ojai	Nearest site for each crop used.
Yolo	Woodland	-
Yuba	Manzanita, or Yuba City	Nearest Sacramento valley site.

2. Assumptions for Crops with Dose-Response Information

A number of assumptions were made for each crop in order to use the dose-response equations for statewide crop loss assessments. These assumptions were based on using information in the crop and air quality data bases, along with discussions with research scientists, county farm advisors, and recommendations from the 1985 and 1986 workshops. The following section details the assumptions for those crops for which ozone exposure-yield response models were available. The equations give data for the county yield loss indexes (I). The indexes are then converted to % loss by equation (3) of Table 4. The equations include ozone concentrations in three forms: 12-hour (0800-1959) growing season averages (12 hr), 7-hour (0900-1559) growing season averages (7 hr), and hours x pphm > 10 pphm for the growing season (10 pphm).

Table 4. Calculation of Ozone Exposure-Crop Loss Percentages

- Sample O_3 Exposure Crop Yield Equation (Linear)

  (1) Yield = a + (b x Ozone exposure)

  where the ozone exposure is a 12-hour (12-hr) or 7-hour (7-hr) growing season average, or hours x pphm for pphm >10 (10 pphm). The 10 pphm equations give percent yield reduction directly.

- Sample County Yield Loss Index Equation

  (2) $I = \frac{a + bx}{a + bx'}$

  where I = loss index as a fraction of 1.00 = no loss; x = ambient air ozone dose or trial ozone standard; and x′ = a 'base' or background dose, e.g., 2.5 pphm seasonal average.

- Sample County Percent Yield Loss Equation

  (3) Percent Loss = (1.00 - I) x 100

- Sample County Potential Yield Equation

  (4) $\text{Potential Yield} = \frac{\text{Actual Yield}}{I}$

- Sample Statewide Potential Yield Equation

  (5) $\text{Statewide Potential Yield Index} = \frac{\Sigma\ \text{Actual Yields}}{\Sigma\ \text{Potential Yields}}$

  where actual yields are for all counties in the State where the crop is grown.

- Sample Statewide Percent Yield Loss Equation

  (6) Statewide Percent Loss = (1.00 - Statewide Potential Yield Index) x 100

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a. 2.5 pphm "Base"

The "Base" in each equation was a "clean air" background ozone concentration. This base has been used to determine crop yield with clean air for comparison to yield with ambient ozone, or any projected ozone concentration in different pollution control scenarios. The base has been assumed to be 2.5 pphm for all yield loss estimates made in this study to date.

The 2.5 pphm base concentration was used because it 1) had previously been proven to be a useful reference point for the U.S. EPA NCLAN crop loss analyses (12-14), and 2) represents an approximate growing season average for major crops grown in relatively "clean air" areas of California.

A 2.5 pphm 7-hour mean background ozone concentration was selected by NCLAN researchers as it 1) was believed to represent the lower tropospheric ozone concentration attributed to transport from the stratosphere, 2) represented ozone concentrations at sites not affected by transport from anthropomorphic sites, and 3) represented the charcoal filtered treatments from the NCLAN-sponsored crop loss experiments (14). All of these assumptions can be questioned; however, NCLAN has continued to use this as a background ozone value.

An analysis of data from 15 "rural" air monitoring sites in California indicated a wide range of ozone concentrations that could be considered "background" levels (Table 5). The sites were selected to represent different geographical areas of the state, but are by no means inclusive of all geographical areas or sites within geographical areas. A more in-depth analysis of growing season ozone concentrations statewide is described in Appendix C to more fully understand "background" ozone concentrations.

The 2.5 pphm "base" average is also a reasonable approximation of the 2.0-3.0 pphm growing season average for seven agricultural rural sites: Ukiah, Salinas, Morro Bay, Santa Maria, Aptos, Vacaville, and Santa Rosa. Many of these sites are low altitude areas subjected to coastal influences during the summer resulting in low ozone concentrations due to ocean breezes. Three low altitude sites have ozone concentrations of 3.0-4.0 pphm: Lakeport, Paso Robles, and Nipomo. The reasons for the slightly higher ozone concentrations for these sites are uncertain, especially for difference between the Nipomo and Santa Maria sites which are less than 16 kilometers (10 miles) apart.

The five higher altitude rural sites: Mammoth, Trona, Yreka, Burney, and Redding have the highest growing season ozone concentrations. Mammoth, at over 2100 meters (7,000 feet) has the highest average.

Table 5. Ozone Concentrations (12-Hour Average) at Selected Rural Sites During June-August and April-October Growing Seasons in 1984

County	Site	12-Hour Average (pphm) June-Aug.	12-Hour Average (pphm) April-Oct.
Lake	Lakeport	3.74	3.48
Mendocino	Ukiah	2.56	2.55
Mono	Mammoth	5.03	4.52
Monterey	Salinas	2.35	2.54
San Bernardino	Trona	5.00	4.81
San Luis Obispo	Morro Bay	2.90	3.15
San Luis Obispo	Nipomo	3.69	3.89
San Luis Obispo	Paso Robles	3.40	3.26
Santa Barbara	Santa Maria	2.32	2.61
Santa Clara	Aptos	2.75	3.13
Shasta	Burney	3.41	3.19
Shasta	Redding	4.66	-
Siskiyou	Yreka	4.06	3.43
Solano	Vacaville	2.01	1.81
Sonoma	Santa Rosa	2.50	2.91

None of these sites is in a primary agricultural area, but in the future a higher background ozone concentration may be appropriate for these areas.

The question remains as to what is the most appropriate background ozone concentration for the agricultural areas of the state, especially the Central Valley. Since these areas are at low altitudes a lower background concentration is appropriate. In addition, since 2.0-3.0 pphm ozone is found in rural agricultural areas without big cities, 2.5 pphm is still a reasonable background concentration for most of the state. However, further research will be carried out to determine more appropriate background ozone concentrations in certain areas of the state. Interior valleys and the northern and southern ends of the Central Valley particularly need special evaluation.

Finally, 2.5 pphm was used as the base ozone concentration for both the 7-hour and 12-hour equations. However, if the 12-hour ozone average was 2.5 pphm; then the 7-hour average would be higher or approximately 2.909 pphm as described in Section III.C. Further analysis may use 2.909 as the base concentration for those crops with 7-hour average equations.

b. Crop-by-Crop Assumptions

Each crop was individually evaluated to determine its growing area location in the state, growing season, air monitoring data, and dose-response equations. This information is presented here only for the 20 crops which have dose-response information. If no ozone data was included in the literature for a study, ozone exposures were determined based on hourly outside ozone data available from the ARB for the years during which the studies were conducted. Ambient chamber ozone concentrations were assumed to be 90-95% of outside ozone concentrations and filtered chamber ozone concentrations were assumed to be 20-30% of outside depending on the particular study. For each study the percentage of ozone in filtered specific and ambient chambers was determined by discussions with the Principal Investigator and by results from other studies using the same design of exposure system.

ALFALFA

Location: Statewide, including deserts, mountain valleys.

Growing Season: Feb.-Dec. in Imperial County, Feb.-Sept. in most of the State, May-Sept. in mountain counties and northern counties.

Air Monitoring Data: The air monitoring data used to estimate alfalfa losses had a large number of hours with concentrations > 10 pphm, but relatively low 7- and 12-hr averages because the data were for a long growing period during the year.

Equations:

1. Olszyk et al. (25). A 12-hr ozone dose plant response has been constructed based on EPRI and CARB-sponsored research. The study was conducted at Riverside, using filtered and ambient air chambers. Alfalfa cultivar was Northrup King 512. The study conducted in open-top chambers and air exclusion systems in the field.

$$I = [32.67 - (1.3902 \times 12\text{ hr})]/[32.67 - (1.3902 \times \text{Base})]$$

2. McCool et al. (22); Oshima et al. (27). Ambient gradient in South Coast Air Basin using the hours x pphm > 10 pphm dose. The cultivar was Moapa 69 which is O_3 sensitive. The study conducted with ambient ozone gradient in the field and did not use any exposure facilities.

$$I = [100 - (9.258 \times 10^{-3} \times 10\text{ pphm})] \times .01$$

*3. Brewer (4). CARB-sponsored study conducted at Parlier, filtered and ambient chambers. Original report used an hours x pphm > 10 pphm dose to describe ozone exposure. A 12-hr ozone average was reconstructed from 1978 April-October ozone data of Butler St. site (#240) in Fresno County. Filtered chambers were assumed to have 30% of O_3, ambient chambers had 90% of outside O_3. The raw data for the equation are shown in Table 6. The study used open-top chambers in

Table 6. Ozone Concentrations and Alfalfa Yields

Year	Filtered Chambers		Ambient Chambers	
	O_3 (pphm)	Yield[a]	O_3 (pphm)	Yield
1979	1.73	115	5.18	100
1980	1.91	102	5.73	100
1981	1.60	113	4.80	100
	1.5 x Ambient Chambers		Outside[b]	
1979	7.77	84	5.76	107
1980	8.60	79	6.37	108
1981	7.20	88	5.33	99

[a]Percent of ambient chambers.
[b]Outside plot data were not used in the crop loss equation as there appeared to be greater plant growth in ambient chambers vs. outside.

the field. Data from this equation were used in the preliminary crop loss estimates included in this report. However, data from the Temple et al. (31) equation were used for economic analysis.

$$I = [118.99 - (4.265 \times 12\text{ hr})]/[118.99 - (4.265 \times \text{Base})]$$

4. Temple et al. (31). The 12-hr ozone average equation is based on NCLAN-sponsored research, at Shafter, using filtered, ambient, and plus O_3 chambers; and ozone average equation is based on no water stress. The study was conducted in open-top chambers in the field.

5. Temple et al. (31). A second equation is based on combined no water stress and water stress data for 1982. The equation is not used as 1982 was an unusual "El Niño" weather year.

$$I = [3010\ e^{-(12\text{ hr}/18.7)^{1.57}}]/[3010\ e^{-(12\text{ hr}/18.7)^{1.52}}]$$

Note: Equations were also used for alfalfa seed in the preliminary analysis. However, use of the equations for alfalfa seed has since been terminated as the marketable part of the plant is much different for alfalfa hay vs. seed.

*Used in preliminary crop loss assessment.

BARLEY

Location: Statewide

Growing Season: Dec.-May in most counties, Apr.-Aug. in northern counties and mountain valleys.

Air Monitoring: Relatively low concentrations due to winter months. Some of the Sacramento and San Joaquin Valley sites do not have winter data.

Equation:

*1. Temple et al. (31). The equation uses a 7-hr average based on NCLAN-sponsored research at Shafter. Treatments included filtered, ambient, and plus ozone chambers. No effect of O_3 was found on yield at $\leq$6.4 pphm. The cultivar was 'Poco'. The study was conducted in open-top chambers in the field.

Note: This model of 'no effect' also was used for dry land barley and irrigated barley.

*Used in preliminary crop loss assessment.

BEANS-DRY

Location: Central valley, coastal, and southern California, with different types grown in different areas.

Growing Season: Months reflect the different types of beans grown in different counties.

Air Monitoring: Sites reflect areas in counties where beans are grown. Both 10 pphm and 7- or 12-hr mean O_3 data are relatively high.

Equations:

1. McCool et al. (22). Equation is based on the hours x pphm > 10 pphm dose. Data are from red kidney beans at Riverside. Exposures were in closed-top chambers with different ozone levels.

$$I = [100 - (0.024 \times 10 \text{ pphm})] \times .01$$

*2. Heck et al. (15); Kohut et al. (18). Equation is from Heck et al. (15) based on research, sponsored by NCLAN, using a 7 hr average. Data are from red kidney beans at Ithaca, NY. Exposures were in open-top chambers with filtered, ambient, and plus O_3 air. Data from full chamber plots were used. Other data from only part of the chambers were not used as it did not represent total plant growth in the chambers.

$$I = [2878 \times e^{-(7 \text{ hr}/12.0)^{1.171}}]/[2878 \times e^{-(\text{Base}/12.0)^{1.171}}]$$

Note: The same equations were used for all types of beans even though the different types may vary widely in sensitivity to O_3.

*Used in preliminary crop loss assessment.

CORN-FIELD

Location: Central valley and southern counties

Growing Season: April-August statewide

Air Monitoring: Relatively high concentrations reflecting summer growing season.

Equation:

*1. Kress et al. (20). The equation used was a 7-hr average and was sponsored by NCLAN at Argonne, IL. Exposures were in open-top chambers with filtered, ambient, and plus O_3 air. The common Weibull parameters were as follows: α (11618.5) as mean of 10725 for 'Pioneer 3780' and 12512 for 'PAG 397', σ = 16.0 (corrected for pphm), and c = 3.709.

$$I = [11618.5\ e^{-(7\ hr/16.0)^{3.709}}]/[11618.5 \times e^{-(Base/16.0)^{3.709}}]$$

Note: the equation also was used for silage-corn.

*Used in preliminary crop loss assessment.

CORN-SWEET

Location: Southern California, with some in Central Valley

Growing Season: Feb.-June in Southern California, March-July in Central Valley, April-Aug. in Humboldt County.

Air Monitoring: Moderate O_3 levels due to late spring growth.

Equation:

*1. Thompson et al. (37). 12-hr data were obtained from Riverside-Rubidoux air monitoring station. This was USDA sponsored research using open-top chambers at Riverside. Ambient and Filtered Chambers. Average of two cultivars, 'Bonanza' and 'Monarch Advance'. The O_3 data were for July and August, 1974, from Riverside site #146, Magnolia Ave. The raw data used were as shown in Table 7, with filtered chambers assumed to be 20% of ambient chambers, and ambient chambers assumed to be 95% of outside.

Table 7. Ozone Concentrations and Sweet Corn Yields

Treatment	O_3 (pphm)	Corn Yield (g primary ears) Bonanza	Monarch Advance
Filtered	1.78	334	248
Ambient	8.91	256	232
Outside	9.38	-	-

$$I = [314.98 - (12\ \text{hr} \times 8.4152)]/[314.98 - (\text{Base} \times 8.4152)]$$

*Used in preliminary crop loss assessment.

COTTON

Location: San Joaquin Valley, plus desert areas of Riverside and Imperial counties.

Growing Season: The total growing season was from May-Sept. in San Joaquin Valley, and May-Oct. in desert counties. The peak sensitivity period was Aug.-Sept. in San Joaquin Valley and July-Oct. in desert counties.

Air Monitoring: There was a large difference in the hours x pphm > 10 pphm and 7- or 12-hour average doses between counties, and for the total growing season vs. period of peak sensitivity. There was little difference between total and peak season 7-hr means except for Kern county.

Equations:

1. Heagle et al. (11). 7-hr. NCLAN sponsored at Raleigh, NC. Based on data from filtered, ambient, and plus O_3 open-top field chambers. Data are expressed in lint weight. Cultivar was 'Stoneville 213'.

$$I = [367 \times e^{-(7\ \mathrm{hr}/11.1)^{2.71}}]/[367\ e^{-(\mathrm{Base}/11.1)^{2.71}}]$$

2. Brewer (6). The 7-hr dose has been reconstructed from 1978 O_3 data, and ARB sponsored-research at Parlier. The equation is based on one years of data from filtered, ambient, and plus O_3 open-top field chambers. Earlier cotton data not used. Data in lint weight for cultivars SJ2, SJ5. Original ozone data reported as the hours x pphm > 10 pphm dose. The dose response equation uses Butler St. (#240) data for May-Oct. 1978. The raw data for the equation are shown in Table 8.

$$I = [0.8462 + (0.049 \times \mathrm{Base})]/[0.8462 + (0.049 \times 7\ \mathrm{hr})]$$

Table 8. Ozone Concentrations and Cotton Lint Yields

Treatment	O_3 (pphm)[a]	Yield[b]	
		SJ-2	SJ-5
Filtered	1.63	1.00	1.00
1/3 Filtered	3.80	0.95	0.98
Ambient	4.88	0.85	1.06
2 x Ambient	9.76	0.67	0.72
Outside	5.42	-	-

[a]Filtered chamber was estimated as 30% of outside air and ambient chamber as 90% of outside air.
[b]Corrected for 1.00 = yield in filtered air.

*3. Temple et al. (33). 7-hr. NCLAN-sponsored research at Shafter. Based on data from 1981, non-water stress open-top field chambers with filtered, ambient, and plus O_3 air. Data in lint weight. Cultivar SJ-2.

$$I = [2059 - (82 \times 7\ hr)]/[2059\ (82 \times Base)]$$

4. Temple et al. (33). 7-hr. Same as #3, but using combined water stressed and non-water stressed chambers in 1982.

$$I = [1988 - (1545.32 \times 7\ hr^2)]/[1988 - (1545.32 \times Base^2)]$$

5. Temple et al. (33). 7-hr. Same as #3, but data in number of bolls.

$$I = [423 - (14.89 \times 7\ hr)]/[423 - (14.89 \times Base)]$$

6. Heagle et al. (11). 7-hr. Same as #__, but data in number of bolls.

$$I = [66 \times e^{-(7\ hr/12.5)^{3.13}}]/[66 \times e^{-(Base/12.5)^{3.13}}]$$

7. McCool et al. (22). Data in units of pphm based on exposures along an ambient gradient in the field. Equation gives data in number of bolls. Cultivar is Acala SJ-2.

$$I = [100 - (6.947 \times 10^{-3} \times 10\ pphm)] \times .01$$

GRAIN SORGHUM

Location: Central Valley, desert areas.

Growing Season: June-August in Central Valley, April-June in desert counties.

Air Monitoring: Relatively high ozone concentrations were present due to summer exposures.

Equations:

*1. Kress et al. (19). A 7-hr equation was obtained from NCLAN-sponsored research at Argonne, IL. Based on exposures in open-top field chambers using filtered, ambient, and plus O_3 air. The cultivar was 'DeKalb A28+'.

$$I = [8149 \times e^{-(7\ hr/31.7)^{2.952}}]/[8149 \times e^{-(Base/31.7)^{2.952}}]$$

Note: Little O_3 effect.

*Used in preliminary crop loss assessment.

GRAPES

Location: Central Valley, coastal areas, and south coast areas.

Growing Season: April-October, except for April-June table grapes in Riverside County.

Air Monitoring: Relatively high O_3 concentrations were present due to long growing season in summer months.

Equations:

1. Thompson and Kats (35). A 12-hr equation was constructed from research conducted at Upland. Exposures were in closed-top chambers using filtered and ambient air. Only data for 1969 were used. Ozone data were for April-October from Upland site (#164). Data are for Zinfandel grapes. Filtered chambers were assumed to have 20% of ambient chamber O_3, ambient chambers were assumed to have 95% of outside O_3. Data for 1978 were not used as the grapevine yield primarily reflected plant growth before the experiment started. The raw data for the grape equation are shown in Table 9.

Table 9. Ozone Concentrations and Zinfandel Grape Yields

Treatment	O_3 (pphm)	Yield (g $vine^{-1}$)
Filtered	1.85	8079
Ambient	9.23	3123
Outside	9.72	-

$$I = [9321 - (12\text{ hr} \times 671.55)]/[9321 - (\text{Base} \times 671.55)]$$

Note: The same equations are used for wine, table, and raisin grapes.

*2. Brewer (5; unpublished data). A 12-hr equation was constructed from CARB-sponsored research at Parlier. Exposures were in open-top chambers using filtered and ambient air, and data from 1981, 1982, and 1985 only. Data are from 'Thompson Seedless' grapes. Data for 1979 were not used because the first year of data with perennial crops reflects previous year of exposure more than the treatment year of exposure. Data for 1980 were not used because a mildew infection wiped out the crop. Data for 1984 were not used because this, again, was the first year of data for a new series of exposures on different grapevines. The regression equation was investigated for a variety of exposures: (1) July-September ozone data for the previous years vs. current yield, (2) April-August data for the same year vs. current yield, and (3) both previous year July-September and current year April-August data vs. current yield data. The 1984 O_3 data (2) gave a slightly higher significant correlation with yield, and was used for the crop loss model and all grape crop loss assessments. The raw data for the Brewer grape equation are as shown in Table 10.

Table 10. Ozone Concentrations and 'Thompson Seedless' Grape Yields

Year	Treatment	O_3 (pphm)[a]	Yield[b]
1981	Filtered	1.74	1.006
	Ambient	5.23	0.775
	Outside	5.81	-
1982	Filtered	1.85	1.000
	Ambient	5.54	0.829
	Outside	6.15	-
1985	Filtered	2.01	1.000
	Ambient	6.01	0.689
	Outside	6.68	-

[a]Filtered chambers were assumed to be 30% of outside, ambient chambers were assumed to be 90% of outside. The 1981-1982 date was from the Fresno-Butler Street (#240) site, the 1985 data were from Butler Street for April and May, Parlier (#230) for June and August, and Fresno Drummond Ave. (#244) for July.

[b]The filtered air was set as 1.000 in each year and ambient yield set as a fraction of the filtered air yield.

I = [1.121 - (0.064 x 12 hr)]/[1.121 - (0.064 x Base)]

*Used for preliminary crop loss assessment.

LEMONS

Location: South Coastal areas and San Joaquin Valley

Growing Season: April-October of previous year.

Air Monitoring: Used data for growing season of previous year, i.e. 1983 data for 1984 crop loss estimation.

Equation:

*1. Thompson and Taylor (36). A 12-hr equation was calculated from Kaiser Steel sponsored at two sites in Upland and Cucamonga over four years from 1964-1967. The O_3 data are for April-October from 1962-1966 from San Bernardino (#151). Exposures were in filtered and ambient closed-top chambers. The O_3 level in filtered chambers was assumed to be 20% of ambient chambers, and ambient chambers assumed to be 95% of outside. The 1963 yield data were not used as this was the first treatment yield, and was affected by previous history of the trees. The raw data used in the equation are shown in Table 11.

Table 11. Ozone Concentrations and Lemon Yields

Year	Site	Treatment	O_3 (pphm)	Yield: kg $tree^{-1}$	Yield: Fraction[a]
1964	Upland	Filtered	1.32	123.4	1.000
		Ambient	6.60	52.3	0.424
		Outside	6.95	-	-
	Cucamonga	Filtered	1.32	173.5	1.000
		Ambient	6.60	80.2	0.462
		Outside	6.95		
1965	Upland	Filtered	1.23	131.6	1.000
		Ambient	6.14	86.4	0.657
		Outside	6.46	-	-
	Cucamonga[b]	Filtered	-	-	-
		Ambient	-	-	-
		Outside	-	-	-
1966	Upland	Filtered	1.33	227.5	1.000
		Ambient	6.65	188.8	0.830
		Outside	7.00	-	-
	Cucamonga	Filtered	1.33	176.8	1.000
		Ambient	6.65	109.1	0.617
		Outside	7.00	-	-

[a]Fraction of 1.000 = filtered air.
[b]Yields altered by low air flow rates in chambers.

$$I = [1.1005 - (0.0770 \times 12\text{-hr})]/[1.1005 - (0.0770 \times \text{Base})]$$

*Used in preliminary crop loss assessment.

LETTUCE

Location: Central Valley, South Coast, Salinas Valley, southern deserts

Growing Season: Central Valley - Aug.-April, South Coast - Oct.-April, Salinas Valley - Jan.-Oct., Santa Barbara - Jan.-Dec., deserts - Jan.-March and Sep.-Dec.

Air Monitoring: The O_3 concentrations were low reflecting non-summer growing season.

Equations:

1. Olszyk et al. (26). A 12-hr equation was calculated from CARB-sponsored research at Riverside in winter using open-top field chambers. Data are for 'Empire' head lettuce exposed in filtered and ambient chambers, and outside plots. There was no reduction in yield in ambient vs. field chambers with a January-March O_3 average of 4.1 pphm.

2. McCool et al. (22). Exposures were at Riverside in closed-top chambers with a series of O_3 concentrations. Data are for leaf lettuce. The original loss equation used the hours x pphm > 10 pphm as the O_3 dose. A 12-hr equation also was calculated, but did not result in a significant yield loss with O_3.

$$I = [100 - (5.19 \times 10^{-2} \times 10 \text{ pphm})] \times .01$$

*3. Temple et al. (30). A 7-hr equation was calculated based on NCLAN-sponsored research in open-top field chambers at Shafter in the fall, 1983. Data are for head lettuce in filtered, ambient, and plus O_3 open-top chambers. The lettuce cultivar was 'Empire'.

$$I = [3187 \times e^{-(7\text{ hr}/12.2)^{8.837}}]/[3187 \times e^{-(\text{Base}/12.2)^{8.837}}]$$

There was a previous lettuce equation published in Heck et al. (13), which based on a lettuce study conducted at Riverside in the fall of 1981. This data should not be used as there was damage to the chambers during a wind storm, and the lettuce was harvested early.

Note: The growing season for 1984 actually includes part of late 1983 for some crops of lettuce in some areas. However, for lettuce and all other cool season crops, the ozone data used in the assessment are from early 1984 and late 1984.

*Used in preliminary crop loss assessment.

ONIONS

Location: Central Valley, coastal areas, desert areas.

Growing Season: Months vary greatly with type of onion and county.

Air Monitoring: O_3 levels vary with time of year and area.

Equation:

*1. McCool et al. (22), and unpublished data. A 12-hr equation was calculated based on exposures at Riverside in closed-top chambers with a series of O_3 concentrations. Data are for green onions. The equation originally used a dose of hours x pphm > 10 pphm (22), but was recalculated.

$$I = [11.1 - (0.881 \times 12 \text{ hr})]/[11.1 - (0.881 \times \text{Base})]$$

Note: The same equation is used for onions dry-dehydrated, dry-fresh, and total, undifferentiated.

*Used in preliminary crop loss assessment.

ORANGES

Location: San Joaquin Valley, South Coast areas.

Growing Season: April-October of previous year, statewide. Trees assumed to be semi-dormant during November-March.

Air Monitoring: O_3 concentrations quite high due to summer growing season.

Equations:

*1. D. M. Olszyk, 1986, unpublished data; and Kats et al. (17). A 12-hr equation was calculated based on CARB sponsored research in open-top chambers at Riverside. Exposures with Valencia orange trees were in chambers with filtered, half ambient, and ambient air. The equation is based on April-October 1985 O_3 data and 1986 yield data (Table 12).

Table 12. Ozone Concentrations and Valencia Orange Yields

Treatment	O_3 (pphm)	Yield[a]
Filtered	0.9	31.4
Half Ambient	3.7	28.1
Ambient	7.1	20.7

[a]Kg per tree. The loss equation used all individual tree values vs the average O_3 concentration per treatment.

$$I = [33.452 - (12\text{ hr} \times 1.726)]/[33.452 - (\text{Base} \times 1.726)]$$

2. Thompson and Taylor (36). A 12-hr equation was calculated based on Kaiser Steel Company sponsored research at Upland. Exposures with Navel orange trees in closed-top chambers with filtered or ambient air. Equation based on April-October 1965-1968 yield data, and 1964-

1967 O_3 April-October data from San Bernardino (#151). The O_3 concentration in filtered chambers was assumed to be 20% of ambient chambers, and filtered chambers were assumed to be 95% of outside air. The first year yield data (1964) were not used in the analysis. The raw data for the equation are shown in Table 13.

Table 13. Ozone Concentrations and Navel Orange Yields

Year	Treatment	O_3 (pphm)	Yield[a]
1965	Filtered	1.23	140.7
	Ambient	6.14	55.2
	Outside	6.46	-
1966	Filtered	1.33	175.8
	Ambient	6.65	68.6
	Outside	7.00	-
1967	Filtered	1.28	143.2
	Ambient	6.41	28.9
	Outside	6.75	-

[a]Kg per tree.

$$I = [178.1 - (12 \text{ hr} \times 19.0873)]/[178.1 - (\text{Base} \times 19.0873)]$$

Note: The crop loss indexes, potential yield, and statewide loss index in the printouts are for 1984 based on 1983 O_3 data.

*Used in preliminary crop loss assessment.

POTATOES

Location: Northern counties, Central Valley, inland South Coast areas.

Growing Season: Varies with area, either summer in north and coastal areas, or spring inland in Central Valley and inland South Coast.

Air Monitoring: O_3 concentrations vary with growing season.

Equation:

1. Foster (8); Foster et al. (9). A 12-hr equation was calculated based on exposures at Riverside in closed-top chambers with a series of O_3 concentrations. The cultivar was 'Centennial'. The O_3 data are for October-November, 1978, from the Riverside-Magnolia St. Air Monitoring Site (#146). Ambient closed-top chambers were considered to have 90% of outside O_3, filtered closed-top chambers were considered to have 20% of outside O_3 based on measurements reported in Olszyk et al. (25). Raw data used for the equation are shown in Table 14.

   The equation was not used for a statewide assessment because it did not accurately represent ozone exposures in the primary potato growing areas of the state. The ozone dose in the equation is quite low due to the low 12-hour average over the entire October-November exposure period in 1978. However, most of the yield reduction likely was due to high ozone episodes at the beginning of the study in early October and not the growing season average. In fact, there were a number of hourly ozone values over 10 pphm with a maximum of 27 pphm in outside air. These exposure conditions will not occur during the January-July growing season in Kern county, or the June-September growing season in Siskiyou county; the two most important potato counties. The estimated county losses are included in Appendix B for comparison purposes only.

Table 14. Ozone Concentrations and Potato Yields

Treatment	O_3 (pphm)	Yield (g $plant^{-1}$)
Filtered	0.716	1504
	0.716[a]	1384
1/3 Ambient	1.18	1056
	1.18[a]	1293
2/3 Ambient	2.40	1265
	2.40[a]	1028
Ambient	3.19	876
	3.19[a]	710
Outside	3.58	603

[a]These treatments also had 10 pphm SO_2, however, the SO_2 did not have any affect on yield, so the data were used with O_3 alone for the yield loss equation.

$$I = [1576.9 - (241.13 \times 12 \text{ hr})]/[1576.9 - (241.13 \times \text{Base})]$$

2. A second equation based on the Foster et al. (8) data were calculated based on the hours x pphm > 10 pphm dose (21).

$$I = [100 - (0.0103 \times 10 \text{ pphm})] \times .01$$

This equation was not used for the crop loss assessment as it was generated with ambient ozone treatments at Riverside which had much higher peak values than the rest of the state.

RICE

Location: Central Valley.

Growing Season: May-Sept.

Air Monitoring: Moderately high O_3 concentrations reflecting summer growing season.

Equation:

1. Kats et al. (16). A 0900-1559 7-hr equation was calculated from CARB-sponsored research at Riverside. Exposures were to O_3 in open-top chambers 5 hr per day (1000-1559) for 5 days per week. The O_3 concentration was assumed to be 2.5 pphm in filtered chambers and the other 2 hr daily (0900-0959 and 1500-1559), as well as on Saturdays and Sundays. The equation averages data from three cultivars, 'M7', 'M9' and 'S201'. The raw data for the equation are shown in Table 15.

Table 15. Ozone Concentrations and Rice Yields

Treatment[a]	O_3 (pphm)[b]	Yield[c]		
		M7	M9	S201
Filtered	2.5	1.000	1.000	1.000
Filtered + 5 pphm O_3	3.2	0.947	0.980	0.938
Filtered + 10 pphm O_3	4.7	0.896	1.076	0.929
Filtered + 15 pphm O_3	6.2	0.897	0.816	0.857
Filtered + 20 pphm O_3	7.7	0.872	0.699	0.758

[a] O_3 is for 5 hr/day, 5 days/week.
[b] The actual 7-hour, 7 days per week O_3 average.
[c] Yields based on 1.000 = yield in filtered air to normalized yields between the three cultivars.

$$I = [1.1382 \times e^{-(7\ \mathrm{hr} \times 0.0470)}]/[1.1382 \times e^{-(\mathrm{Base} \times 0.0470)}]$$

*Used in preliminary crop loss assessment.

SPINACH

Location: Coastal counties.

Growing Season: Jan.-May and Oct.-Dec. in all counties except for Jan.-March and Sept.-Dec. in Riverside and Ventura counties.

Air Monitoring: Low O_3 concentrations reflecting winter exposures.

Equation:

*1. McCool et al. (22). An equation was calculated based on the hours x pphm > 10 pphm dose. Exposures were at Riverside in closed-top chambers with a series of O_3 concentrations. The cultivar was 'Bloomsdale'.

$$I = [100 - (4.006 \times 10^{-2} \times 10 \text{ pphm})] \times .01$$

2. Heagle et al. (10). An equation was calculated based on 7-hr means, using four cultivars grown in the ground or in pots inside open-top chambers. The raw data for the equation are shown in Table 16. The data for all cultivars was integrated into the equation by normalizing all data as a fraction of 1.000, where 1.000 equals the yield in filtered chambers.

Table 16. Ozone Concentrations and Spinach Yields

Treatment	O_3 (pphm)	Yield[a] America	Yield[a] Winter Bloomsdale	Yield[a] Hybrid 7	Yield[a] Viroflay
		Plants in Pots			
Filtered air	2.4	1.00	1.00	1.00	1.00
Filtered + 6 pphm O_3	5.6	0.89	0.92	0.94	1.06
Filtered + 10 pphm O_3	9.6	0.67	0.65	0.71	0.89
Filtered + 13 pphm O_3	12.9	0.40	0.30	0.29	0.41
		Plants in Ground			
Filtered air	2.4	1.00	1.00	1.00	1.00
Filtered + 6 pphm O_3	5.6	0.77	0.81	0.96	0.74
Filtered + 10 pphm O_3	9.6	0.61	0.56	0.65	0.65
Filtered + 13 pphm O_3	12.9	0.30	0.27	0.39	0.28

[a]Yield as a fraction of filtered = 1.00 to correct for differences in spinach cultivar yield.

$$I = [1.199 - (7\text{ hr} \times 0.0625)]/[1.199 - (\text{Base} \times 0.0625)]$$

*Used in preliminary crop loss assessment. Please note that the McCool et al. (27) spinach equation had been used in the preliminary economic assessments, however the Heagle et al. (10) equation will be used from now on as it uses a 7 hr mean.

STRAWBERRIES

Location: Coastal areas, with some in Central Valley and inland in southern California.

Growing Season: Jan.-Dec. except for Jan.-May and Oct.-Dec. for inland areas of southern California.

Air Monitoring: O_3 concentrations low reflecting winter growing season or coastal growing area.

Equations:

*1. McCool et al. (22). An equation was calculated based on a hours x pphm > 10 pphm dose. Exposures were to a gradient of ambient O_3 concentrations across the south coast air basin. No loss in yield was found even with the highest ozone concentrations.

*Used in preliminary crop loss assessment.

SUGAR BEETS

Location: Statewide.

Growing Season: Peak sensitivity month is June statewide except for March-April in Imperial county.

Air Monitoring: O_3 concentrations can be high in some areas due to summer exposure.

Equations:

1. McCool et al. (22). An equation was calculated based on the hours x pphm > 10 pphm dose. Exposures were conducted in the South Coast Air Basin in field plots located along a gradient of ambient O_3 concentrations. No O_3 effect was found. The cultivar was USH-108.

*2. Brewer (3). An equation was calculated based on the hours x pphm > 10 pphm dose based on research sponsored by CARB at Parlier. Exposures were in open-top chambers with filtered or ambient air. No O_3 effect was found.

3. McCool et al. (22, and unpublished data). An equation for red table beets was included for comparison to sugar beet equations. The equation was calculated for a 12-hr dose based on closed-top chamber experiments in Riverside.

$$I = [64.7 - (2.58 \times 12 \text{ hr})]/[64.7 - (2.58 \times \text{Base})]$$

TOMATOES-FRESH

Location: Central Valley and coastal areas.

Growing Season: May-Sept. in Central Valley except for April-July in Kings, Tulare and Merced counties, March-August in southern coastal areas.

Air Monitoring: O_3 concentrations can be high reflecting summer exposures.

Equations:

*1. McCool et al. (22). An equation was calculated based on the hours x pphm > 10 pphm dose. The exposures in ambient air without chambers across south Coast Air Basin. The cultivar was '6718 VF'.

$$I = [100 - (2.32 \times 10^{-2} \times 10 \text{ pphm})] \times .01$$

Notes: Data were for pole tomatoes.

*Used in preliminary crop loss assessment.

TOMATOES-PROCESSING

Location: Central Valley and coastal areas.

Growing Season: May-Sept. in Central Valley except for April-July in Kern county, and March-August in southern coastal areas except for April-August in Ventura county.

Air Monitoring: O_3 concentrations can be high reflecting summer exposures.

Equations:

1. McCool et al. (22). An equation was calculated based on the hours x pphm > 10 pphm dose. Exposures were in closed-top chambers, The cultivar was VF-145-B7879.

$$I = [100 - (2.28 \times 10^{-2} \times 10 \text{ pphm})] \times .01$$

*2. Heck et al. (15); Temple et al. (31). A 7-hr equation was calculated based on research sponsored by NCLAN at Livermore. Exposures were to filtered, ambient, and plus O_3 air in open-top chambers. The data are for the 'Marrieta' cultivar. Only the 1981 data were used as the 1982 data were for exposures during the unusual 'El Niño' weather conditions which made the plants more sensitive to O_3 than in 1981. However, O_3 concentrations also were not as high during the 'El Niño' conditions in 1981 compared to 1982.

$$I = [32.9 \times e^{-(7 \text{ hr}/14.2)^{3.807}}]/[32.9 \times 3^{-(\text{Base}/14.2)^{3.807}}]$$

3. R. Brewer, unpublished data. An equation was calculated based on 12-hr reconstructed Parlier ozone data for July and August 1985. The study was conducted in open-top chambers. The raw data are as shown in Table 17:

Table 17. Ozone Concentrations and Red Tomato Yields

Treatment	O_3 (pphm)[a]	Yield (lbs)
Filtered air	2.03	481
1/3 Filtered	4.74	566
Ambient	6.09	407
1 1/2 Ambient	9.14	322
Outside	6.77	-

[a]Filtered chamber was assumed to have 30% of outside O_3 concentration, ambient chamber to have 90% of outside O_3 concentration.

The equation was assumed to be plateau-linear, with a straight line between 2.03 and 4.74 pphm, and a linear equation between 4.74 and 9.14 pphm. Instead of a 'BASE' value of 2.5 pphm, a 'BASET' value is used for calculation of yield. The BASET value represents the maximum tomato yield with 12 hr concentrations less than 4.74 pphm. The BASET value is equal to 523.5 (mean of 481 and 566 lbs/plot). The equation unfortunately produces either extremely large (>1000 percent) or negative percentage loss values if the ambient 12-hr average is less than 4.74 pphm. These unusual percentage losses are not used to calculate the potential county yields as the potential yield is assumed to equal the actual yield for these counties.

$$I = [12\ \text{hr}/(0.0044 \times 12\ \text{hr}) - 0.0118]/\text{BASET}$$

*Used in preliminary crop loss assessment.

WHEAT

Location: Statewide.

Growing Season: February-May except for April-August in northern areas and at higher altitudes, and Jan.-April in Imperial county.

Air Monitoring: Low O_3 concentrations reflecting spring growth or northern areas.

Equations:

1. Olszyk et al. (26). A 12-hr equation was calculated based on research sponsored by CARB at Riverside. Exposures were in open-top chambers and air exclusion systems to filtered or ambient air. The average ambient O_3 concentration was 4.7 pphm. Ozone had no effect on wheat yield at this concentration.

*2. Kress et al. (21). A 7-hr equation was calculated sponsored by NCLAN at Argonne, IL. Exposures were in open-top chambers to filtered, ambient, or plus O_3 air. The data are pooled for two cultivars 'Abe' and 'Arthur' and two years of exposure.

$$I = [5295 \times e^{-(7\ hr/14.5)^{3.326}}]/[5295 \times 3^{-(Base/14.5)^{3.326}}]$$

3. Heck et al. (15). A 7-hr equation was calculated based on research sponsored by NCLAN at Ithaca, NY. Exposures were in open-top chambers to filtered, ambient, or plus O_3 air. The data are for one O_3 sensitive cultivar 'Vona'. The equation was not used to estimate yield losses as the predicted losses were unrealistically high and were not found with the more comprehensive study conducted by Kress et al. (20).

$$I = [7857 \times e^{-(7\ hr/5.3)^{1.000}}]/[7857 \times e^{-(Base/5.3)^{1.000}}]$$

Notes: The equations were for undifferentiated, dryland, and irrigated wheat.

*Used in preliminary crop loss assessment.

III. SUMMARY AND DISCUSSION OF PRELIMINARY CROP LOSS ESTIMATES FOR 1984

A. Estimated Percentage Yield Losses

Estimated percent county and statewide yield losses were based on a single exposure-response equation per crop as selected from the crop by county data for all equations shown in Appendix B. The equation chosen per crop was selected based on the following hierarchy: first EPA-NCLAN sponsored research, then CARB-sponsored research, then CDFA or other agency sponsored research. Equations generated by EPA sponsored research were chosen first, as they reflect rigorous studies under defined protocols with substantial quality assurance (14). Most of the EPA-sponsored data have been published in the peer reviewed literature. All of the EPA studies also were designed to provide data for a 7- or 12-hr seasonal ozone averaging period. Crops using EPA-NCLAN research equations for the preliminary assessment and economic analysis were barley, dry beans, field corn, cotton, lettuce, sorghum, processing tomatoes and wheat.

Equations generated by CARB-sponsored research were chosen next. The data also are based on field exposures as is the EPA-sponsored research, however, usually only two or a few ozone treatments were used in the studies. Seven or 12-hr exposure-response equations could be calculated from the data but most of the studies were not designed to provide ozone exposure-plant response regression equation information. For example, only filtered and ambient chamber treatments were used for many studies. These treatments can be used to generate a two point, linear dose-response equation, but the precision of such an equation is much less than if a number of ozone treatments had been used. Furthermore, all of the ozone concentrations for the Brewer studies (3-6) had to be calculated from Fresno County air monitoring sites, some of which are a considerable distance (>16 kilometers) from Parlier. This data may not precisely indicate ozone concentrations at Parlier.

Crops using CARB research equations were: alfalfa, grapes, oranges, rice, and sugar beets. The CARB also sponsored research with cotton, lettuce, processing tomatoes, and wheat which produced results similar to those produced with the EPA-NCLAN equations.

Equations generated by CDFA research were chosen if they were the only equation present for a crop. The CDFA research was designed to provide equations comparing yield to cumulative ozone doses of greater than 10 pphm. A cutoff concentration of 10 pphm was chosen as this is the current primary oxidant standard for California. Comparison of estimated losses with 10 pphm vs. 7- or 12-hr equations indicated that 10 pphm equations produced lower estimates of ozone induced crop losses. This may be due, in part, to the fact that the CDFA research was conducted in the South Coast Air Basin, especially Riverside. Peak ozone concentrations are much higher in this area than the rest of the State, even though 7- or 12-hr mean ozone concentrations are approximately 25 to 33% higher in the South Coast area compared to the southern San Joaquin Valley, Coachella Valley, and other areas of the state.

Crops using CDFA research equations were: onions, spinach, strawberries, and fresh market tomatoes. An equation also was available for potatoes, however, it was not used for a statewide assessment due to difficulty in obtaining reasonable estimated losses for both Riverside County and the rest of the State. Equations using 12-hr ozone averages have now been calculated for onions and potatoes, and 10 pphm equations were still used for strawberries and fresh market tomatoes. Equations using 12-hr ozone means also are now available for lettuce, table beets, and turnips.

The equation for lemons was based on research sponsored by Kaiser Steel Company in the 1960's and represents the only data available for this crop. The estimated losses were similar to those for Valencia Oranges, even though the orange losses were based on a more recent experiment. The Valencia orange losses are much less than the Navel orange losses estimated from 1960's research. If the Navel orange equation does in fact overestimate losses due to methodological problems in the 1960's, the lemon losses also may be overestimated because they were based on studies using similar chambers.

The equation for sweet corn was based on research funded in part by the U.S.D.A. Western Regional Research Laboratory, Berkeley, California. It used 1974 oxidant (not ozone) data from Riverside, California.

Appendix B summarizes crop losses by county for all crops in the CAR data base. Losses are given for each equation per crop, but only those starred on pages 20-50 were used for the preliminary statewide assessment.

Table 18 indicates losses to California crops for those crops with loss models and estimated losses of $\geq 7\%$. These crops are defined as having information and are at risk from ozone. Table 19 indicates losses to crops for those crops with models and estimated losses of $\leq 5\%$. These crops are defined as having information, but at little risk from ozone.

Table 18. Preliminary Estimate of Statewide Losses to California Agricultural Crops from Ozone in 1984: Crops with Loss Models and at Risk

Crop	Value (Million $)	Yield Loss (%)
Alfalfa Hay	652 (as hay)	9.3
Beans-dry	91	23.2
Corn-sweet	22	6.6
Cotton	1,064	19.6
Grapes (all)	848	20.8
Lemons	96	28.3
Onions (all)	112	23.2
Oranges	402	19.3
Rice	249	10.4
Total	3,536	

Table 19. Preliminary Estimate California Agricultural Crops with Loss Models and Little Risk from Ozone in 1984

Crop	Value (Million $)	Yield Loss (%)
Barley (all)	85	0
Corn-field	171	1.7
Lettuce	541	0
Silage-corn	120	3.5
Sorghum	12	0
Spinach	9	0
Strawberries	318	0
Sugar Beets	207	0
Tomatoes-Fr.	158	2.8
Tomatoes-Pr.	427	4.5
Wheat (all)	223	1.7
Total	2,271	

Table 20 indicates crops without models, but which could be experiencing losses because they are exposed to relatively high ozone concentrations during their growing seasons. These crops are defined as without information and at risk from ozone. Table 21 indicates crops without models, and which are not likely to be experiencing losses from ozone. They are grown either in geographical areas or months when little ozone is present. Those crops are defined as without information and at little risk from ozone.

Table 20. Preliminary Estimate of California Agricultural Crops without Information and at Risk from Ozone in 1984 (Large Production in Counties with 12 Hr Means ≥ 5.0 pphm)

Crop	Value (Million $)	% of Tons at ≥ 5.0 pphm[a]
Alfalfa Seed[b]	59	67
Asparagus	60	69
Avocados	91	90
Cantaloup	125	96
Figs	10	100
Grapefruit	31	97
Honeydew	36	51
Lima Beans	18	62
Nectarines	42	92
Olives	48	73
Peaches	141	72
Pistachios	60	100
Plums	48	90
Potatoes[c]	242	10
Walnuts	161	59
Watermelons	16	78
Total	1,185	

[a]The percentage of all statewide production occurring in counties with 12 hour ozone averages of ≥ 5.0 pphm during the growing season.
[b]Alfalfa seed was considered to have a 10.4% loss in the economic analysis based on the Temple et al. (31) equation.
[c]Potatoes are sensitive to ozone based on research by Foster et al. (8,9), however, the loss equation cannot be used for a statewide assessment.

Table 21. Preliminary Estimate of California Agricultural Crops without Loss Models and at Little Risk from Ozone in 1984:
(Low Production in Counties with 12 Hr Means ≥ 5.0 pphm)

Crop	Value (Million $)	% of Tons at ≥ 5.0 pphm[a]
Almonds	470	24
Apples	70	8
Apricots	34	10
Brocolli	220	0
Carrots	145	0
Cauliflower	136	8
Celery	180	0
Cherries	26	7
Garlic	11	0
Grain Hay	36	1
Oats	8	0
Pears	50	7
Prunes	103	14
Safflower	28	25
Total	1,517	

[a]The percentage of all statewide production occurring in counties with 12 hour ozone averages ≥ 5.0 pphm during the growing season. For these crops, the majority of the production is in counties with ozone averages <5.0 pphm.

Finally, Table 22 indicates a grouping of crops for which an assessment as to ozone risk is not possible. Nursery and flower crops are economically very important and are grown in heavily populated areas of the state. However, many different species are included and most of the species have not been studied for air pollution sensitivity.

The miscellaneous vegetable crop category includes specialty crops such as parsley and green peppers. These crops are important locally. Dose response equations exist for some of these crops such as parsley, turnips and table beets; but cannot be used at present because production is not specified by county in the CAR Model.

The preliminary estimates for all categories of crops are summarized in Table 23. Crops at risk with large losses account for over one-third the value of all crops in the state. Together with the crops without information, but at risk due to ozone exposure; one-half of the crops in the state are at risk from ozone. However, it must be remembered that these crops are at potential risk, assuming that ozone is the main factor affecting crop growth during the growing season. The research with which

Table 22. Preliminary Estimates of Statewide Losses to California Agricultural Crops from Ozone in 1984: No Information and Unknown Risk

Crop	Value (Million $)
Nursery	720
Flowers	524
Misc.	544
Total	1,788

Table 23. Summary of Assessment of Risk to California Crops from Ozone in 1984[a]

Type of Crops	Number	Value (Million $)	% Statewide Value
Loss models, at risk	9	3,536	34.3
Loss models, little risk	10	2,271	22.1
No information, at risk	16	1,185	11.5
No information, little risk	14	1,517	14.7
No information, unknown risk	3	1,788	17.4
Total	52	10,297	100.0

[a]Source: CDFA (7), all types of onions, barley, or wheat were considered to be single crops.

risk is determined was conducted in chambers under field conditions, so the estimated losses are reasonable. However, actual crops growing in the field would still be affected by environmental and pest factors to a greater extent than under experimental conditions.

B. Crop Losses with Different Ozone Standard Scenarios

Crop loss estimates also were prepared for six possible ozone concentration scenarios in addition to the scenario using 1984 ambient ozone data. For these estimations the background ozone concentration again always was assumed to be 2.5 pphm. For three scenarios the growing season ambient ozone averages were changed to 4.0, 5.0, and 6.0 pphm, respectively, for counties with greater than 4.0, 5.0, or 6.0 pphm seasonal averages. Counties with ambient ozone averages less than 4.0, 5.0, or 6.0 remained unchanged for the estimations. The 4.0, 5.0, or 6.0 pphm standards were assumed to be the same for both 7- or 12-hr averages; even though with a 12-hr standard of 4.0, 5.0, or 6.0, the 7-hr averages would be higher. For example, a 7-hr average of 5.826 pphm is equivalent to a 12-hr average of 5.0 pphm.

The simple rollback, modified rollback, and >10=10 scenarios were based on reconstruction of the hourly ozone data base for all of 1984. For the >10=10 scenario, all hourly ozone values greater than 10 pphm were set to equal 10 pphm, and all other ozone values remained the same. This scenario represented conditions where all sites in California would be in compliance with the current California one-hour ozone standard of 10 pphm.

For the modified rollback scenario all hourly ozone values greater than 4.0 pphm were reduced at a site so that maximum value was 10 pphm. All these hourly values were reduced in proportion to the reduction in the maximum value according to the formula: modified hourly value in pphm = 4.0 + {[(hourly value - 4.0) x (10.0 - 4.0)]/(peak hourly value - 4.0)}. If no hourly values were greater than 10 pphm than all data for the site was unchanged. All data less than 4.0 pphm also were unchanged.

For the simple rollback scenario all hourly values for each site were reduced so that the maximum value was 10 pphm. The reduction was in proportion to the change from the highest ozone value in the state in 1984 to 10 pphm. If no hourly values were greater than 10 pphm than all data for the site was unchanged.

Overall, the >10=10 and 6 pphm ozone standards produced little change in the estimated crop loss based on actual ambient data for 1984 (Table 24). Only lemons had a reduction in crop loss by >5%. This was primarily because it is largely grown only in areas of southern California where there are a substantial number of peak ozone values >10 pphm. The similarity between the 6 pphm and 1984 ambient yield losses also indicated that the growing season average ozone concentration is close to 6 pphm for all crop in California.

A standard of 5 pphm over the growing season resulted in potential reductions in losses (>5%) for four important crops: dry beans, cotton, grapes, and lemons (Table 24). Yield losses also were reduced by 3 to 4% for oranges and processing tomatoes. The modified rollback scenario produced overall yield loss reductions similar those with the 5 pphm standard. However, the crop-by-crop losses varied with the two scenarios; with lower losses for eight crops with the modified rollback, and lower losses for six crops with the 5 pphm standard.

Either the 4 pphm standard or simple rollback scenario was required to substantially reduce the losses for nearly all crops (Table 24). However, even with these scenarios which call for drastic reductions in ozone concentrations; crops such as dry beans, cotton, grapes, lemons, oranges, and rice still had from 7 to 15 % loss.

A different background concentration would change the estimated reductions proportionally. An estimated background of <2.5 pphm would result in greater reductions in estimated losses with the proposed standards. An estimated background of >2.5 pphm would result in less reduction in estimated losses with the proposed standards. An additional point to be considered is the background ozone concentration for a 7 hr vs. as 12 hr average. A 7 hr background concentration of 2.909 is equivalent to a 12 hr average of 2.5 pphm.

C. Assessment of Crop Loss Equations

For several crops, e.g., alfalfa, cotton, lettuce, grapes, tomatoes, and wheat, there were multiple available equations which produced similar estimates of statewide crop yield loss from ozone (Table 25). The results with cotton were especially interesting with three equations based on research at different sites, with different cultivars, and conducted in different years; all producing estimates of approximately 20% crop loss.

Table 24. Estimated Crop Losses with Different Ozone Scenarios and Ambient Ozone Concentrations[a]

Crop	Estimated Loss (%)						
	Simple Rollback	4 pphm Standard	Modified Rollback	5 pphm[b] Standard	6 pphm Standard	<10=10	1984 Ambient
Alfalfa hay							
Temple[b]	2.2	4.3	5.9	7.4	7.5	7.4	7.6
Brewer[b]	3.0	5.6	6.5	8.0	9.2	9.0	9.3
Alfalfa seed[d]	3.6	4.5	8.7	7.5	10.1	10.1	12.3
Barley (all)	0	0	0	0	0	0	0
Dry Beans	14.7	10.5	20.3	16.8(21.8)[c]	22.7	26.3	27.2
Corn-Field	0.4	0.4	1.0	1.0(1.4)	1.5	1.6	1.7
Corn-Sweet	0.6	3.8	3.6	5.4	6.1	5.9	6.1
Cotton	9.3	6.6	13.6	11.1(14.6)	15.3	19.1	19.6
Grain Sorghum	0	0	0	0	0	0	0
Grapes (all)	7.7	9.4	14.3	15.2	19.5	20.3	20.8
Lemons	5.4	12.7	15.4	20.8	22.8	24.8	28.3
Lettuce	0	0	0	0	0	0	0
Onions (all)	5.1	14.2	14.8	20.8	22.9	22.3	23.2
Oranges	6.4	8.9	12.5	14.7	18.2	18.1	19.3
Rice	8.5	6.8	9.6	9.2(10.1)	10.2	10.3	10.4
Silage-Corn	0.7	0.5	1.6	1.2	2.2	3.1	3.5
Spinach-10 pphm[e]	0	0	0	0	0	0	0
Spinach-7 hr[e]	1.2	3.8	3.2	3.8	3.8	3.8	3.8
Sugar Beets	0	0	0	0	0	0	0
Tomatoes-Fresh	0	1.7	0	2.8	2.8	0	2.8
Tomatoes-Proc.	1.0	0.6	2.1	1.6(3.4)	2.6	4.3	4.5
Wheat (all)	0.3	0.8	1.0	1.4(1.7)	1.7	1.6	1.7

[a]Versus a background ozone concentration of 2.5 pphm.

[b]The data from Temple et al. (31) were used in the preliminary economic analysis. However, because the Temple et al. (31) paper has not been published at present, the Brewer (4) data were used in the ARB staff assessment.

[c]Numbers in parentheses are for a 7-hr standard at 5.826 pphm which is proportional to a 12-hr standard of 5.0 pphm.

[d]Alfalfa seed numbers based on the Temple et al. (31) equation were included in preliminary economic analysis, but will not be used for further analysis due to possible differences in response to ozone between vegetative and reproductive growth.

[e]The hours x pphm > 10 pphm dose was used for the preliminary economic analysis, however, the 12 hour equation will be used from now on as it was based on exposures more represent of ozone patterns in California spinach growing areas.

Table 25. Comparative Statewide Yield Loss Estimates with Different Equations

Crop	Reference	Ozone Dose	Statewide Yield Loss (%)[a]
Alfalfa	McCool et al. (22)	10 pphm	2.2
	Olszyk et al. (25)	12 hr	11.8
	Brewer (4)	12 hr	9.3
	Temple et al. (31)	12 hr	7.6
Cotton	McCool et al. (22)	10 pphm	1.1
	Brewer (6)	7 hr	18.2
	Temple et al. (33)	7 hr	19.6
	Heagle et al. (11)	7 hr	23.6
Dry Beans	McCool et al. (22)	10 pphm	3.4
	Heck et al. (15)	7 hr	27.2
Grapes	Brewer (5)	12 hr	20.8
	Thompson and Kats (35)	12 hr	27.7
Lettuce	McCool et al. (22)	10 pphm	0.8
	Olszyk et al. (26)	12 hr	0
	Temple et al. (30)	7 hr	0
Oranges	Olszyk (unpublished data)	12 hr	19.3
	Thompson and Taylor (36)	12 hr	48.4
Tomatoes	McCool et al. (22)	10 pphm	2.5
	Temple et al. (32)	7 hr	4.4
	Brewer (unpublished, data)	12 hr	14.3
Wheat	Kress et al. (21)	7 hr	1.7
	Olszyk et al. (26)	12 hr	0
	Heck et al. (15)	7 hr	28.0

[a]For 1984 ambient ozone data

For some crops such as oranges, tomatoes, and wheat there are large differences in estimated crop loss with different equations that use the same ozone dose. For oranges the equations are based on different types of trees (Washington Navel vs. Valencia), different numbers of research years, and greatly different designs of field chamber. For tomatoes, the

Brewer data were based on a preliminary analysis of one years worth of unpublished data so the results can not be considered as reliable as the Temple et al. (32) data. However, since the reduction is yield with ambient ozone appeared to be real and the methodoloy was similar to that for the NCLAN study, the Brewer data emphasis a need for additional study of tomatoes. For wheat, the Kress et al. (21) data were based on two years of exposure with two cultivars in a potentially wheat growing area of Illinois. Thus, these estimated losses are more likely than the large losses estimated with one cultivar in one year (15). It is likely that 'Vona' was unusually sensitive to ozone under the exposure conditions used at Ithaca, New York (15).

Comparison of cumulative dose equation for hours x pphm >10 pphm, vs. 7- or 12-hr average exposure-response equations indicated that the 10 pphm equations produce different estimates of the effects of ozone on crop production on a statewide basis. For example, estimated losses are negligible with the 10 pphm dose compared to 7- or 12-hr averages for alfalfa, dry beans, and and cotton (Table 25). The 10 pphm doses likely produce different losses because they are based on research conducted with ambient ozone levels in the South Coast Air Basin. Peak ozone concentrations are much higher in this area of the state compared to the Central Valley and other agricultural areas, even though the 7- or 12-hr averages are only slightly greater in the South Coast area than in some agricultural areas such as Fresno or Kern counties. Ambient ozone definitely is affecting crop yields in the San Joaquin Valley, based on field research conducted at Parlier and Shafter. Thus the growing season average and not the peak ozone values > 10 pphm may be more important in affecting crop yield in the San Joaquin Valley and other areas of California.

The 10 pphm equation data were similar to the 7- or 12-hr average data only for lettuce and tomatoes. This similarity in losses likely occurred only because both crops were relatively resistant to ozone and had low yield losses with either 10 pphm or 7- or 12-hr based equations.

D. Correlations Between Crop Productivity and Ozone Exposure Parameters

The possible effects of ozone on crop production were evaluated from a slightly different angle by comparing the actual tons/acre and ozone exposure parameters for each crop. The ozone exposure parameters were either 10 pphm, 7-hr average, or 12-hr average; with counties as replicates (n). There were few significant correlations between exposure and productivity based on correlation coefficients as shown in Table 26. Thus, the relationship between current ambient ozone concentrations and actual productivity seemed to be a poor indicator of whether a crop is being affected by ozone. The poor production vs. ambient ozone exposure correlations were not surprising due to many confounding variables such as crop management, cultivar, and even slightly different growing seasons between counties.

There were significant negative correlations between ozone exposure and productivity (indicating detrimental effect on yield) for only five crops. These crops and significant doses were: barley-dryland (10 pphm), grain sorghum (10 pphm, 7 hr, and 12 hr), honeydew melons (10 pphm, 7 hr, and 12 hr), onions-dry fresh (7 hr and 12 hr), and rice (10 pphm, 7 hr, and 12 hr). None of the three exposure parameters seemed to be better correlated with adverse effects on productivity. Furthermore, the relationship between the known, experimentally based sensitivity of different crops to ozone and the significance of the above correlation is poor; two crops- barley and grain sorghum are known to be quite resistant to ozone, while the other two crops- onions and rice are more sensitive.

Four crops actually showed significant positive correlations between ozone exposure and productivity (Table 26). The crops and significant exposures were: alfalfa (10 pphm, 7 hr, and 12 hr), almonds (7 hr and 12 hr), dry beans (10 pphm, 7 hr, and 12 hr), and cotton (10 pphm). Again, these correlations bore little relationship to the known sensitivity to ozone for these crops as alfalfa, dry beans and cotton all have been shown to be adversely affected by ozone. The significant positive correlation between ozone and yield may be solely due to higher air temperatures in areas with greater ozone exposures, or other non-air pollution related factors.

Table 26. Correlation Coefficients Between Tons/Acre (10 pphm, 7- and 12-hr doses)[a]

Crop	n	r for 10 pphm	Tons/Acre vs. 7 hr	Tons/Acre vs. 10 pphm	r for 10 pphm vs. 7 hrs	r for 10 pphm vs. 12 hrs	r for 7 vs 12
Alfalfa Hay	41	0.461*	0.326*	0.272*	0.636*	0.596*	0.896*
Alfalfa Seed	8	-0.016	0.374	0.328	0.867*	0.881*	0.996*
Almonds	19	0.412	0.474*	0.494*	0.854*	0.848*	0.994*
Apples	22	-0.236	-0.294	-0.305	0.687*	0.673*	0.988*
Apricots	13	-0.179	0.233	0.277	0.661*	0.629*	0.996*
Asparagus	9	-0.223	-0.226	-0.263	0.751*	0.780*	0.995*
Avocados[b]	12	0.339	0.352	0.312	0.796*	0.773*	0.976*
Barley	34	-0.241	0.311	-0.314	0.524*	0.470*	0.990*
Barley-Dry	43	-0.353*	0.131	-0.111	0.488*	0.436*	0.986*
Barley-Irr.	34	-0.249	0.144	0.156	0.508*	0.462*	0.989*
Beans-Dry	25	0.419*	0.498*	0.514*	0.593*	0.579*	0.989*
Brocolli	9	0.464	0.200	0.204	0.758*	0.787*	0.991*
Cantaloupes	7	0.070	0.130	0.136	0.578	0.496	0.993*
Carrots	6	-0.407	-0.012	-0.140	0.628	0.719*	0.981*
Cauliflower	13	0.156	0.096	0.056	0.799*	0.794*	0.996*
Celery	7	0.356	-0.208	-0.326	0.592	0.420	0.977*
Cherries	9	-0.483	0.304	0.193	0.329	0.437	0.982*
Corn-Field	12	-0.188	-0.298	-0.289	0.686*	0.606*	0.991*
Corn-Sweet	12	-0.113	0.208	0.225	0.751*	0.708*	0.994*
Cotton	8	0.774*	-0.354	-0.428	1.000*	0.985*	0.985*
Figs	3	0.396	-0.762	-0.774	0.292	0.276	1.000*
Garlic	5	0.600	0.248	0.254	0.849*	0.852*	1.000*

(continued)

Table 26 (continued) - 2

Crop	n	r for 10 pphm	Tons/Acre vs. 7 hr	Tons/Acre vs. 10 pphm	r for 10 pphm vs. 7 hrs	r for 10 pphm vs. 12 hrs	r for 7 vs 12
Grain Hay	42	-0.184	-0.311	-0.278	0.577*	0.542*	0.989*
Grain Sorghum	17	-0.563*	-0.600*	-0.602*	0.655*	0.626*	0.996*
Grapefruit[b]	8	-0.115	0.021	0.064	0.971*	0.950*	0.987*
Grapes Raisin	7	0.351	0.213	0.302	0.588	0.553	0.991*
Grapes Table	7	0.416	0.302	0.170	0.841*	0.772*	0.982*
Grapes Wine	30	-0.166	0.199	0.242	0.690*	0.636*	0.991*
Honeydew	6	-0.907*	-0.796*	-0.819*	0.833*	0.836*	0.999*
Lemons[b]	12	0.152	-0.237	-0.300	0.821*	0.755*	0.970*
Lettuce	16	0.315	-0.013	-0.002	0.545*	0.418	0.968*
Lima bean	4	0.046	-0.176	-0.120	0.975*	0.983*	0.997*
Nectarines	9	-0.167	0.083	0.096	0.891*	0.904*	0.994*
Oats	34	-0.573*	-0.052	-0.032	0.374*	0.343*	0.996*
Olives	10	0.345	0.358	0.300	0.827*	0.806*	0.995*
Onions Dry(de)	8	-0.406	0.321	0.341	0.896*	0.866*	0.996*
Onions Dry(fr)	11	-0.548	-0.642*	-0.634*	0.896*	0.866*	0.996*
Onions Dry(tot)	14	-0.353	0.033	-0.010	0.678*	0.758*	0.978*
Oranges[b]	12	0.037	-0.258	-0.196	0.815*	0.815*	0.993*
Pasture-Ir	53	-----[c]	------	------	0.571*	0.530*	0.990*
Peaches	19	-0.273	-0.135	-0.160	0.449*	0.540*	0.986*

(continued)

Table 26 (concluded) - 3

Crop	n	r for 10 pphm	Tons/Acre vs. 7 hr	Tons/Acre vs. 10 pphm	r for 10 pphm vs. 7 hrs	r for 10 pphm vs. 12 hrs	r for 7 vs 12
Pears	18	-0.052	-0.263	-0.312	0.702*	0.739*	0.992*
Pistachios	6	-0.202	-0.243	-0.350	0.784*	0.753*	0.990*
Plums	11	-0.428	0.264	0.225	0.390	0.455	0.994*
Potatoes	10	0.233	0.410	0.376	0.752*	0.706	0.985*
Prunes	17	0.439	0.416	0.408	0.783*	0.760*	0.994*
Rice	14	-0.619*	-0.650*	-0.609*	0.876*	0.882*	0.996*
Safflower	11	0.543	0.271	0.234	0.709*	0.687*	0.996*
Silage Corn	19	0.344	-0.004	-0.050	0.740*	0.632*	0.987*
Spinach	6	0.236	0.049	0.026	0.697	0.650	0.996*
Strawberries	12	-0.027	0.055	0.086	0.727*	0.681*	0.991*
Sugar beets	25	-0.299	-0.143	-0.159	0.570*	0.622*	0.991*
Tomatoes Fresh	18	0.028	0.179	0.216	0.744*	0.665*	0.989*
Tomatoes Process.	20	-0.102	0.034	0.109	0.681*	0.652*	0.989*
Walnuts	35	-0.206	0.157	0.129	0.340*	0.441*	0.986*
Watermelon	7	0.573	0.613	0.573	0.953*	0.940*	0.994*
Wheat	35	-0.115	0.025	0.015	0.545*	0.530*	0.988*
Wheat-Dry	38	-0.155	-0.119	-0.142	0.569*	0.552*	0.989*
Wheat-Irr.	35	0.218	0.127	0.067	0.566*	0.552*	0.990*

[a]Coefficients followed by "*" are statistically significant at $p<0.05$.
[b]Ozone and yield data are both from 1984 even though 1983 ozone data are more appropriate for correlation with 1984 yield. However, the 1984 ozone data are similar to that in 1984 and, thus, the correlation coefficients give a reasonable estimation of relationship between ozone concentration and yield for these crops.
[c]No production data available.

The 7- and 12-hr averages were highly correlated for each crop, with r >0.97 for all crops (Table 26). An additional analysis using all 7- and 12-hr data across all sites regardless of crop indicated a linear regression model between 7-hr (independent variable) and 12-hr (dependent variable) averages of 12 hr = 0.0064 + (0.8571 * 7 hr), with r = 0.984, and n = 1716 for 7- vs 12-hr monthly average comparisons. Thus, each 12-hr growing season average could be approximated by multiplying the 7-hr average by 0.86, and each 7-hr average could be approximated by multiplying the 12-hr average by 1.167. The 7- and 12-hr averages were correlated with the 10 pphm doses for most crops, however, the r values were much lower than the r value for 7- vs. 12-hr averages.

E. "Mini"-Workshop to Review Preliminary Crop Loss Assessment

A "mini"-workshop was held at the University of California, Riverside, campus on June 4-5, 1986, to assess the progress of the Crop Loss Assessment program since the 1985 workshop at Lake Arrowhead. Attendees are shown in Appendix C, and included seven CARB staff members, 10 U.C. Riverside scientists, and three invited outside reviewers: Dr. Dick Howitt of U. C. Davis, Dr. Harris Benedict of Pasadena, and Dr. Richard Adams of Oregon State University.

Recommendations from the mini-workshop were as follows:

(1) Consider 'background' ozone values other than 2.5 (e.g., 3.5, 5.0).

(2) Redo graphics so that only those areas of counties actually containing a crop are colored.

(3) Carefully consider ozone dose or averages used in crop loss equations.

(4) Consider potential ozone standards in the calculation.

(5) Use estimated losses for those crops without information to see how important those losses would be in evaluating the overall effect of ozone on agriculture.

(6) Interact closely with the economic assessment modelers.

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V. APPENDICES

APPENDIX A

Printout of Crop Tons, Growing Season, and Ozone Air Monitoring Sites by Crop and County for 1984

Note: Crop tons are for counties specifically reporting this crop. Growing seasons are for periods of peak sensitivity to ozone. Ozone sites are nearest rural or urban site(s). Certain sites have been used for multiple counties, and certain sites have been averaged together within counties. Exclusively urban sites have been excluded, especially from the South Coast Air Basin, San Francisco Bay Area Air Basin, Sacramento, San Diego, Fresno, and Bakersfield.

Ozone Air Monitoring Sites used for 1984 Assessment

County No.	Site No.	County Name	Site Name
01	340	Alameda	Livermore
04	628	Chico	Manzanita
06	643	Colusa	Fairgrounds
07	440	Contra Costa	Concord
07	442	Contra Costa	Bethel Island Rd.
10	230	Fresno	Parlier
10	240	Fresno	Butler St. (1983 Citrus)
10	241	Fresno	Cal. St. (1983 Citrus)
10	243	Fresno	Herndon
11	673	Glenn	Willows
13	685	Imperial	El Centro
15	203	Kern	Chester St. (1983 Citrus)
15	242	Kern	Edison-Bkrsfl. E.
15	243	Kern	Oildale
16	701	Kings	Hanford
17	713	Lake	Lakeport
19	072	Los Angeles	Long Beach
19	080	Los Angeles	Whittier
19	082	Los Angeles	Lancaster
19	089	Los Angeles	Newhall
21	451	Marin	San Rafael
23	763	Mendocino	Ukiah
26	785	Mono	Mammoth Lakes
27	544	Monterey	Salinas
28	783	Napa	Napa
30	177	Orange	La Habra
30	186	Orange	El Toro
30	192	Orange	Costa Mesa
31	810	Placer	Rocklin
31	813	Placer	Auburn
33	137	Riverside	Palm Springs
33	139	Riverside	Indio

(continued)

Ozone Air Monitoring Sites used for 1984 Assessment
(continued)

County No.	Site No.	County Name	Site Name
33	141	Riverside	Hemet
33	144	Riverside	Riverside-Rubidoux
33	149	Riverside	Perris
33	150	Riverside	Banning
33	155	Riverside	Norco
34	286	Sacramento	Meadow View
34	287	Sacramento	Folsom
35	823	San Benito	Hollister
36	155	San Bernardino	Barstow
36	175	San Bernardino	Upland (1983 Lemon)
36	188	San Bernardino	Trona
36	190	San Bernardino	Victorville
36	192	San Bernardino	Redlands
36	194	San Bernardino	San Bernardino
36	197	San Bernardino	Fontana
36	198	San Bernardino	Chino
37	114	San Diego	Chula Vista
37	115	San Diego	Escondido
37	133	San Diego	Del Mar
37	134	San Diego	Oceanside
39	252	San Joaquin	Stockton-Hazelton
39	267	San Joaquin	Stockton-Mariposa
40	832	San Luis Obispo	Paso Robles
40	833	San Luis Obispo	Morro Bay
40	834	San Luis Obispo	Nipomo
40	835	San Luis Obispo	San Luis Obispo
40	844	San Luis Obispo	Grover City
41	541	San Mateo	Redwood City
42	363	Santa Barbara	Goleta
42	369	Santa Barbara	Santa Ynez
42	370	Santa Barbara	El Capitan Beach
42	377	Santa Barbara	Santa Maria

(continued)

Ozone Air Monitoring Sites used for 1984 Assessment
(concluded)

County No.	Site No.	County Name	Site Name
43	389	Santa Clara	Gilroy
44	845	Santa Cruz	Aptos
45	560	Shasta	Redding, Placer St.
45	563	Shasta	Burney
47	861	Shiskiyou	Yreka
48	881	Solano	Vacaville
49	887	Sonoma	Sonoma
49	893	Sonoma	Santa Rosa
50	562	Stanislaus	Turlock
50	568	Stanislaus	Modesto
51	895	Sutter	Yuba City
54	568	Tulare	Visalia
54	576	Tulare	Mt. Home
56	419	Ventura	El Rio
56	427	Ventura	Piru
56	430	Ventura	Ojai
57	569	Yolo	Woodland

	CROP		COUNTY	ACRES	TONS	GROWING SEASON		AIR MONITORING SITES			
1510	ALFALFA HAY	1	ALAMEDA	1050.	6205.	FEB	SEP	01340			
		3	AMADOR	221.	1237.	MAY	SEP	31813			
		4	BUTTE	3500.	24500.	FEB	SEP	04628			
		6	COLUSA	5750.	32200.	FEB	SEP	04628			
		7	CONTRA COSTA	1470.	11000.	FEB	SEP	07440			
		10	FRESNO	80000.	720000.	FEB	SEP	10230	10243		
		11	GLENN	16500.	113850.	FEB	SEP	04628			
		12	HUMBOLT	256.	763.	APR	SEP	23763			
		13	IMPERIAL	169302.	1481392.	FEB	DEC	33139			
		14	INYO	4760.	28560.	MAY	SEP	36188	26785		
		15	KERN	83000.	661000.	FEB	SEP	15242	15243		
		16	KINGS	26006.	207007.	FEB	SEP	16701			
		17	LAKE	600.	3960.	FEB	SEP	17713			
		18	LASSEN	23000.	101200.	MAY	SEP	47861			
		19	LOS ANGELES	12176.	99589.	FEB	SEP	19082			
		20	MADERA	36000.	253080.	FEB	SEP	10243			
		24	MERCED	63590.	437300.	FEB	SEP	50568			
		25	MODOC	28100.	126450.	MAY	SEP	47861			
		26	MONO	7888.	45356.	MAY	SEP	26785			
		27	MONTEREY	8350.	63700.	FEB	SEP	27544			
		32	PLUMAS	5500.	16830.	MAY	SEP	31813			
		33	RIVERSIDE	42995.	395984.	FEB	SEP	33149	33139	33155	
		34	SACRAMENTO	4600.	32200.	FEB	SEP	34287			
		35	SAN BENITO	2300.	13800.	FEB	SEP	35823			
		36	SAN BERNARDINO	26100.	188000.	FEB	SEP	36155	36190	33155	
		39	SAN JOAQUIN	47200.	328000.	FEB	SEP	39252			
		40	SAN LUIS OBISPO	9345.	56070.	FEB	SEP	40832	40833	40834	40835
		42	SANTA BARBARA	6537.	48308.	FEB	SEP	42377			
		43	SANTA CLARA	1000.	3000.	FEB	SEP	35823			
		45	SHASTA	19500.	97500.	MAY	SEP	45560	45563		
		46	SIERRA	1500.	3150.	MAY	SEP	31813			
		47	SISKIYOU	72000.	360000.	MAY	SEP	47861			
		48	SOLANO	11200.	56000.	FEB	SEP	48881			
		50	STANISLAUS	25000.	164000.	FEB	SEP	50568			
		51	SUTTER	5413.	33916.	FEB	SEP	04628			
		52	TEHAMA	4800.	28300.	FEB	SEP	04628			
		53	TRINITY	185.	440.	APR	SEP	23763			
		54	TULARE	90000.	763000.	FEB	SEP	54568			
		56	VENTURA	530.	2650.	FEB	SEP	56427			
		57	YOLO	24400.	136640.	FEB	SEP	57569			
		58	YUBA	760.	5016.	FEB	SEP	04628			
1512	ALFALFA SEED	10	FRESNO	46600.	18190.	FEB	SEP	10230	10243		
		11	GLENN	1107.	124.	FEB	SEP	04628			
		13	IMPERIAL	7383.	1597.	APR	SEP	33139			
		16	KINGS	24376.	9555.	FEB	SEP	16701			
		18	LASSEN	390.	69.	MAY	SEP	47861			
		19	LOS ANGELES	150.	23.	MAY	SEP	19082			
		48	SOLANO	6.	1.	MAY	SEP	48881			
		51	SUTTER	64.	9.	MAY	SEP	04628			
1352	ALMONDS	4	BUTTE	34587.	28016.	FEB	JUL	04628			
		6	COLUSA	15500.	5425.	FEB	JUL	04628			
		7	CONTRA COSTA	2180.	375.	FEB	JUL	07440			
		10	FRESNO	26300.	24700.	FEB	JUL	10230	10243		
		11	GLENN	11766.	6824.	FEB	JUL	04628			
		15	KERN	70946.	65400.	FEB	JUL	15242	15243		
		16	KINGS	3872.	3640.	FEB	JUL	16701			
		17	LAKE	109.	11.	FEB	JUL	17713			
		20	MADERA	24970.	14982.	FEB	JUL	10243			

		24	MERCED	58254.	48400.	FEB	JUL	50568	
		39	SAN JOAQUIN	34475.	26200.	FEB	JUL	39252	
		40	SAN LUIS OBISPO	5979.	251.	FEB	JUL	40832	
		48	SOLANO	2777.	1145.	FEB	JUL	48881	
		50	STANISLAUS	54853.	48545.	FEB	JUL	50568	
		51	SUTTER	4949.	3712.	FEB	JUL	04628	
		52	TEHAMA	5018.	3145.	FEB	JUL	04628	
		54	TULARE	9636.	7610.	FEB	JUL	54568	
		57	YOLO	8450.	3900.	FEB	JUL	57569	
		58	YUBA	1538.	1230.	FEB	JUL	04628	
1301	APPLES	4	BUTTE	191.	1776.	APR	OCT	04628	
		5	CALAVERAS	140.	490.	APR	OCT	50562	
		9	EL DORADO	645.	4220.	APR	OCT	31813	
		12	HUMBOLT	68.	133.	APR	OCT	23763	
		15	KERN	769.	7720.	APR	OCT	15242	15243
		20	MADERA	393.	1862.	APR	OCT	10243	
		22	MARIPOSA	175.	438.	APR	OCT	54576	
		23	MENDOCINO	723.	6215.	APR	OCT	23763	
		27	MONTEREY	432.	6625.	APR	OCT	27544	
		29	NEVADA	83.	42.	APR	OCT	31813	
		31	PLACER	58.	253.	APR	OCT	31810	31813
		33	RIVERSIDE	32.	64.	APR	OCT	33150	
		35	SAN BENITO	450.	4455.	APR	OCT	35823	
		36	SAN BERNARDINO	230.	370.	APR	OCT	36192	
		37	SAN DIEGO	332.	432.	APR	OCT	37115	
		39	SAN JOAQUIN	503.	9050.	APR	OCT	39252	39267
		40	SAN LUIS OBISPO	306.	918.	APR	OCT	40832	
		44	SANTA CRUZ	5500.	82252.	APR	OCT	44845	
		47	SISKIYOU	85.	271.	APR	OCT	47861	
		49	SONOMA	6824.	71913.	APR	OCT	49887	49893
		51	SUTTER	201.	2157.	APR	OCT	51895	
		55	TUOLUMNE	100.	310.	APR	OCT	50562	
1309	APRICOTS	7	CONTRA COSTA	1180.	5990.	APR	MAY	07440	
		10	FRESNO	347.	2190.	APR	MAY	10230	10243
		15	KERN	315.	1490.	APR	MAY	15242	15243
		16	KINGS	236.	1850.	APR	MAY	16701	
		24	MERCED	1483.	10400.	APR	MAY	50562	
		33	RIVERSIDE	100.	414.	APR	MAY	33149	
		35	SAN BENITO	2600.	13000.	APR	MAY	35823	
		39	SAN JOAQUIN	2982.	24000.	APR	MAY	39252	39267
		43	SANTA CLARA	800.	2000.	APR	MAY	43389	
		48	SOLANO	1297.	5148.	APR	MAY	48881	
		50	STANISLAUS	8846.	70200.	APR	MAY	50562	50568
		54	TULARE	241.	1710.	APR	MAY	54568	
		57	YOLO	900.	2592.	APR	MAY	57569	
1416	ASPARAGUS	7	CONTRA COSTA	1800.	2353.	JUN	SEP	07442	
		13	IMPERIAL	2127.	2340.	APR	JUL	33139	
		27	MONTEREY	3150.	5445.	JUN	SEP	27544	
		30	ORANGE	754.	1433.	MAY	AUG	30186	
		33	RIVERSIDE	2238.	2417.	MAY	AUG	33139	
		34	SACRAMENTO	1770.	2660.	JUN	SEP	34286	
		39	SAN JOAQUIN	18700.	26200.	JUN	SEP	39252	39267
		48	SOLANO	538.	592.	JUN	SEP	48881	
		57	YOLO	1535.	1151.	JUN	SEP	57569	
1315	AVOCADOS	10	FRESNO	368.	346.	MAY	OCT	10230	10243
		15	KERN	172.	116.	MAY	OCT	15242	15243
		19	LOS ANGELES	208.	200.	MAY	OCT	19080	
		30	ORANGE	1782.	7930.	MAY	OCT	30177	
		33	RIVERSIDE	7852.	35318.	MAY	OCT	33149	37115 33155
		36	SAN BERNARDINO	145.	510.	MAY	OCT	36192	

		37	SAN DIEGO	35683.	160574.	MAY OCT	37115			
		40	SAN LUIS OBISPO	1523.	1812.	MAY OCT	40833	40834		
		42	SANTA BARBARA	6863.	27521.	MAY OCT	42369	42370		
		44	SANTA CRUZ	60.	30.	MAY OCT	44845			
		54	TULARE	1882.	1860.	MAY OCT	54568			
		56	VENTURA	16251.	52070.	MAY OCI	56419	56427	56430	
1240	BARLEY	1	ALAMEDA	1550.	1503.	JAN MAY DEC	01340			
		3	AMADOR	190.	247.	JAN MAY DEC	31813			
		4	BUTTE	4500.	7600.	JAN MAY DEC	04628			
		6	COLUSA	2800.	4200.	JAN MAY DEC	04628			
		7	CONTRA COSTA	1170.	1260.	JAN MAY DEC	07440			
		10	FRESNO	59000.	113000.	JAN MAY DEC	10230	10243		
		11	GLENN	4500.	2700.	JAN MAY DEC	04628			
		13	IMPERIAL	476.	1176.	JAN MAY DEC	33139			
		15	KERN	21000.	37700.	JAN MAY DEC	15242	15243		
		16	KINGS	18621.	32587.	JAN MAY DEC	16701			
		17	LAKE	500.	540.	JAN MAY DEC	17713			
		18	LASSEN	3200.	4992.	APR AUG	47861			
		19	LOS ANGELES	8835.	1096.	JAN MAY DEC	19082			
		20	MADERA	6500.	13000.	JAN MAY DEC	10243			
		24	MERCED	9330.	15900.	JAN MAY DEC	50568			
		25	MODOC	22320.	50920.	APR AUG	47861			
		27	MONTEREY	48000.	36000.	JAN MAY DEC	27544			
		33	RIVERSIDE	23460.	3988.	JAN MAY DEC	33149	33155		
		34	SACRAMENTO	1750.	4380.	JAN MAY DEC	57569			
		35	SAN BENITO	9800.	11070.	JAN MAY DEC	35823			
		36	SAN BERNARDINO	1980.	2280.	JAN MAY DEC	36192	33155		
		39	SAN JOAQUIN	6110.	9570.	JAN MAY DEC	39252			
		40	SAN LUIS OBISPO	98700.	108570.	JAN MAY DEC	40832	40833	40834	40835
		41	SAN MATEO	800.	800.	JAN MAY DEC	41541			
		42	SANTA BARBARA	1519.	1261.	JAN MAY DEC	42377			
		43	SANTA CLARA	2000.	6000.	JAN MAY DEC	35823			
		45	SHASTA	1700.	3200.	APR AUG	45560	45563		
		47	SISKIYOU	40100.	113610.	APR AUG	47861			
		48	SOLANO	6300.	5355.	JAN MAY DEC	48881			
		50	STANISLAUS	5000.	3800.	JAN MAY DEC	50568			
		51	SUTTER	7595.	10697.	JAN MAY DEC	04628			
		52	TEHAMA	2100.	1785.	JAN MAY DEC	04628			
		54	TULARE	25000.	55500.	JAN MAY DEC	54568			
		57	YOLO	9500.	12350.	JAN MAY DEC	57569			
1248	BARLEY-DRYLAND	1	ALAMEDA	2000.	2760.	JAN MAY DEC	01340			
		2	ALPINE	100.	72.	JAN MAY DEC	26785			
		3	AMADOR	200.	240.	JAN MAY DEC	31813			
		4	BUTTE	5500.	3192.	JAN MAY DEC	04628			
		6	COLUSA	600.	792.	JAN MAY DEC	04628			
		7	CONTRA COSTA	500.	576.	JAN MAY DEC	07440			
		9	EL DORADO	200.	408.	JAN MAY DEC	31813			
		10	FRESNO	5000.	5712.	JAN MAY DEC	10230	10243		
		11	GLENN	3800.	5688.	JAN MAY DEC	04628			
		14	INYO	2800.	2424.	JAN MAY DEC	36188			
		15	KERN	9800.	12144.	JAN MAY DEC	15242	15243		
		16	KINGS	6000.	7272.	JAN MAY DEC	16701			
		17	LAKE	100.	120.	JAN MAY DEC	17713			
		18	LASSEN	200.	192.	APR AUG	47861			
		19	LOS ANGELES	4500.	1056.	JAN MAY DEC	19082			
		20	MADERA	1000.	1200.	JAN MAY DEC	10243			
		22	MARIPOSA	100.	72.	JAN MAY DEC	50568			
		23	MENDOCINO	400.	384.	JAN MAY DEC	23763			
		24	MERCED	5500.	6600.	JAN MAY DEC	50568			
		25	MODOC	2300.	2208.	APR AUG	47861			

		27	MONTEREY	38000.	35520.	JAN	MAY	DEC	27544			
		30	ORANGE	2000.	1152.	JAN	MAY	DEC	30186			
		31	PLACER	100.	96.	JAN	MAY	DEC	31810	31813		
		33	RIVERSIDE	12700.	7032.	JAN	MAY	DEC	33149	33155		
		34	SACRAMENTO	100.	240.	JAN	MAY	DEC	57569			
		35	SAN BENITO	5100.	5640.	JAN	MAY	DEC	35823			
		36	SAN BERNARDINO	1000.	480.	JAN	MAY	DEC	36192	33155		
		37	SAN DIEGO	2900.	2568.	JAN	MAY	DEC	37114	37115		
		39	SAN JOAQUIN	500.	720.	JAN	MAY	DEC	39252			
		40	SAN LUIS OBISPO	95700.	96264.	JAN	MAY	DEC	40832	40833	40834	40835
		41	SAN MATEO	700.	792.	JAN	MAY	DEC	41541			
		42	SANTA BARBARA	400.	264.	JAN	MAY	DEC	42377			
		43	SANTA CLARA	4000.	1920.	JAN	MAY	DEC	35823			
		47	SISKIYOU	15900.	34560.	APR	AUG		47861			
		48	SOLANO	4700.	6048.	JAN	MAY	DEC	48881			
		50	STANISLAUS	4100.	4536.	JAN	MAY	DEC	50568			
		51	SUTTER	3500.	3360.	JAN	MAY	DEC	04628			
		52	TEHAMA	1100.	768.	JAN	MAY	DEC	04628			
		54	TULARE	5900.	7440.	JAN	MAY	DEC	54568			
		55	TUOLUMNE	100.	96.	JAN	MAY	DEC	50568			
		56	VENTURA	2500.	1800.	JAN	MAY	DEC	56419			
		57	YOLO	6500.	8592.	JAN	MAY	DEC	57569			
		58	YUBA	200.	288.	JAN	MAY	DEC	04628			
1249	BARLEY-IRRIGATED	1	ALAMEDA	500.	720.	JAN	MAY	DEC	01340			
		4	BUTTE	300.	288.	JAN	MAY	DEC	04628			
		5	CALAVERAS	100.	120.	JAN	MAY	DEC	31813			
		6	COLUSA	2200.	3432.	JAN	MAY	DEC	04628			
		10	FRESNO	54000.	107568.	JAN	MAY	DEC	10230	10243		
		11	GLENN	700.	1344.	JAN	MAY	DEC	04628			
		13	IMPERIAL	900.	1512.	JAN	MAY	DEC	33139			
		14	INYO	200.	240.	JAN	MAY	DEC	36188			
		15	KERN	13900.	33360.	JAN	MAY	DEC	15242	15243		
		16	KINGS	21000.	50400.	JAN	MAY	DEC	16701			
		18	LASSEN	3000.	5040.	APR	AUG		47861			
		19	LOS ANGELES	600.	792.	JAN	MAY	DEC	19082			
		20	MADERA	5000.	7320.	JAN	MAY	DEC	10243			
		24	MERCED	5500.	10560.	JAN	MAY	DEC	50568			
		25	MODOC	20000.	47040.	APR	AUG		47861			
		27	MONTEREY	10000.	10560.	JAN	MAY	DEC	27544			
		33	RIVERSIDE	700.	1008.	JAN	MAY	DEC	33149	33155		
		34	SACRAMENTO	500.	1200.	JAN	MAY	DEC	57569			
		35	SAN BENITO	500.	1080.	JAN	MAY	DEC	35823			
		36	SAN BERNARDINO	1000.	960.	JAN	MAY	DEC	36192	33155		
		37	SAN DIEGO	300.	504.	JAN	MAY	DEC	37115			
		39	SAN JOAQUIN	2500.	5760.	JAN	MAY	DEC	39252			
		40	SAN LUIS OBISPO	1000.	1200.	JAN	MAY	DEC	40832	40833	40834	40835
		41	SAN MATEO	300.	432.	JAN	MAY	DEC	41541			
		42	SANTA BARBARA	500.	600.	JAN	MAY	DEC	42377			
		45	SHASTA	1000.	2256.	APR	AUG		45560	45563		
		47	SISKIYOU	34100.	81840.	APR	AUG		47861			
		48	SOLANO	200.	432.	JAN	MAY	DEC	48881			
		49	SONOMA	100.	96.	JAN	MAY	DEC	49893			
		50	STANISLAUS	1900.	4104.	JAN	MAY	DEC	50568			
		51	SUTTER	3500.	5040.	JAN	MAY	DEC	04628			
		52	TEHAMA	1300.	1248.	JAN	MAY	DEC	04628			
		54	TULARE	14100.	33840.	JAN	MAY	DEC	54568			
		57	YOLO	300.	216.	JAN	MAY	DEC	57569			
1762	BEANS-DRY	4	BUTTE	4800.	3200.	JUL	AUG		04628			
		6	COLUSA	8250.	7425.	JUL	AUG		06643			
		10	FRESNO	13000.	11700.	JUL	AUG		10230	10243		

		11	GLENN	7703.	4206.	JUL AUG	11673	
		12	HUMBOLT	15.	13.	JUL AUG	23763	
		15	KERN	9020.	9580.	JUL AUG	15242	15243
		16	KINGS	1946.	1985.	JUL AUG	16701	
		20	MADERA	4600.	4324.	JUL AUG	50562	10243
		24	MERCED	10250.	9330.	JUL AUG	50562	
		26	MONO	150.	173.	JUL AUG	26785	
		27	MONTEREY	4105.	4275.	APR SEP	27544	
		30	ORANGE	482.	603.	APR SEP	36192	
		33	RIVERSIDE	620.	620.	JUN AUG	33155	
		36	SAN BERNARDINO	715.	785.	JUN AUG	33155	
		39	SAN JOAQUIN	23700.	21700.	JUL SEP	39252	39267
		40	SAN LUIS OBISPO	1100.	220.	APR SEP	40834	
		41	SAN MATEO	40.	14.	APR SEP	41541	
		42	SANTA BARBARA	6724.	4295.	JUN AUG	42369	42377
		48	SOLANO	5810.	5520.	JUL SEP	48881	
		50	STANISLAUS	35500.	36400.	JUL SEP	50562	50568
		51	SUTTER	18998.	17138.	JUN AUG	51895	
		52	TEHAMA	1000.	720.	JUN AUG	45560	04628
		54	TULARE	10000.	11100.	JUL SEP	54568	
		57	YOLO	2600.	1768.	JUL SEP	57569	
		58	YUBA	1017.	641.	JUN AUG	51895	
1421	BROCCOLI	10	FRESNO	1480.	9920.	MAR JUN SEP DEC	10230	10243
		13	IMPERIAL	4994.	25519.	JAN APR SEP DEC	33139	
		27	MONTEREY	57495.	281210.	JAN DEC	27544	
		33	RIVERSIDE	1872.	8095.	JAN APR SEP DEC	33139	
		35	SAN BENITO	950.	10155.	JAN DEC	35823	
		40	SAN LUIS OBISPO	4313.	21873.	JAN DEC	40834	40844
		42	SANTA BARBARA	19462.	107027.	JAN DEC	42377	
		43	SANTA CLARA	280.	1540.	JAN DEC	35823	
		56	VENTURA	4589.	29636.	JAN DEC	56419	
1460	CANTALOUPES	10	FRESNO	26700.	267000.	APR JUL	10230	10243
		13	IMPERIAL	18141.	103948.	FEB JUN AUG OCT	33139	
		15	KERN	1900.	20400.	MAR MAY	15242	15243
		16	KINGS	1158.	10237.	APR JUL	16701	
		24	MERCED	8080.	67995.	APR JUL	50562	
		33	RIVERSIDE	6518.	61139.	MAR MAY	33139	
		50	STANISLAUS	1075.	7960.	APR JUL	50562	
1410	CARROTS	13	IMPERIAL	7913.	185322.	JAN APR SEP DEC	33139	
		15	KERN	14900.	163000.	JAN DEC	15242	15243
		27	MONTEREY	5810.	129715.	JAN DEC	27544	
		33	RIVERSIDE	3149.	62804.	JAN APR SEP DEC	33139	
		35	SAN BENITO	180.	3780.	JAN DEC	35823	
		40	SAN LUIS OBISPO	1370.	35620.	JAN DEC	40834	
1469	CAULIFLOWER	10	FRESNO	1026.	19300.	JAN DEC	10230	10243
		13	IMPERIAL	1006.	8239.	JAN APR SEP DEC	33139	
		27	MONTEREY	26550.	145355.	JAN DEC	27544	
		30	ORANGE	827.	4549.	JAN JUN	30186	
		33	RIVERSIDE	663.	2562.	JAN JUN	33139	
		35	SAN BENITO	400.	4650.	JAN DEC	35823	
		37	SAN DIEGO	735.	5880.	JAN JUN	37134	
		40	SAN LUIS OBISPO	1234.	7990.	JAN DEC	40834	
		42	SANTA BARBARA	7585.	46356.	JAN DEC	42377	
		43	SANTA CLARA	450.	2250.	JAN DEC	35823	
		44	SANTA CRUZ	513.	2247.	JAN DEC	44845	
		50	STANISLAUS	715.	3070.	MAR JUN SEP DEC	50562	
		56	VENTURA	2508.	12490.	JAN DEC	56419	
1414	CELERY	27	MONTEREY	5510.	158675.	FEB NOV	27544	
		30	ORANGE	1117.	32952.	JAN MAR AUG DEC	30186	
		37	SAN DIEGO	380.	12611.	JAN MAR AUG DEC	37134	

		40	SAN LUIS OBISPO	1053.	34086.	APR DEC	40834	
		42	SANTA BARBARA	3021.	78697.	APR DEC	42377	
		44	SANTA CRUZ	390.	6493.	FEB NOV	44845	
		56	VENTURA	11079.	310323.	JAN MAY OCT DEC	56419	
1398	CHERRIES	7	CONTRA COSTA	299.	837.	FEB JUL	07442	
		9	EL DORADO	30.	57.	FEB JUL	31813	
		31	PLACER	6.	22.	FEB JUL	31810	31813
		33	RIVERSIDE	133.	60.	FEB JUL	33150	
		35	SAN BENITO	400.	720.	FEB JUL	35823	
		39	SAN JOAQUIN	8050.	33700.	FEB JUL	39252	
		43	SANTA CLARA	810.	3240.	FEB JUL	43389	
		48	SOLANO	119.	95.	FEB JUL	48881	
		50	STANISLAUS	383.	1650.	FEB JUL	50562	50568
1210	CORN-FIELD	3	AMADOR	631.	2524.	APR AUG	31813	
		4	BUTTE	2000.	8200.	APR AUG	04628	
		6	COLUSA	11000.	42900.	APR AUG	06643	
		7	CONTRA COSTA	7050.	25600.	APR AUG	07442	
		10	FRESNO	11000.	37000.	APR AUG	10230	10243
		11	GLENN	7800.	29640.	APR AUG	11673	
		13	IMPERIAL	836.	2073.	APR AUG	33139	
		15	KERN	8780.	26300.	APR AUG	15242	15243
		16	KINGS	13090.	57989.	APR AUG	16701	
		18	LASSEN	235.	529.	APR AUG	47861	
		20	MADERA	14000.	43120.	APR AUG	50562	10243
		24	MERCED	20300.	64100.	APR AUG	50562	
		27	MONTEREY	450.	2025.	APR AUG	27544	
		33	RIVERSIDE	400.	1400.	APR AUG	33155	
		34	SACRAMENTO	50000.	205000.	APR AUG	34286	34287
		39	SAN JOAQUIN	78000.	349000.	APR AUG	39252	39267
		48	SOLANO	51000.	186150.	APR AUG	48881	
		50	STANISLAUS	6500.	26000.	APR AUG	50562	50568
		51	SUTTER	7745.	30125.	APR AUG	04628	
		52	TEHAMA	2000.	7000.	APR AUG	04628	
		54	TULARE	14000.	45600.	APR AUG	54568	
		57	YOLO	45000.	180000.	APR AUG	57569	
		58	YUBA	605.	2118.	APR AUG	04628	
1402	CORN-SWEET	7	CONTRA COSTA	973.	6062.	MAR JUL	07440	
		12	HUMBOLT	32.	106.	APR AUG	23763	
		19	LOS ANGELES	841.	4025.	FEB JUN	19089	
		30	ORANGE	2346.	17595.	FEB JUN	30186	
		33	RIVERSIDE	3677.	20766.	FEB JUN	33139	
		34	SACRAMENTO	450.	2305.	FEB JUN	57569	
		36	SAN BERNARDINO	105.	525.	FEB JUN	36198	
		37	SAN DIEGO	929.	4831.	MAR JUL	37134	
		39	SAN JOAQUIN	320.	1541.	MAR JUL	39252	
		43	SANTA CLARA	500.	2750.	MAR JUL	43389	
		48	SOLANO	690.	2795.	MAR JUL	48881	
		51	SUTTER	174.	1175.	MAR JUL	04628	
1710	COTTON	10	FRESNO	412000.	230076.	MAY SEP	10230	10243
		13	IMPERIAL	32816.	20440.	MAY OCT	33139	
		15	KERN	343000.	173040.	MAY SEP	15242	15243
		16	KINGS	267292.	132310.	MAY SEP	16701	
		20	MADERA	49360.	23866.	MAY SEP	50562	10243
		24	MERCED	67400.	35000.	MAY SEP	50562	
		33	RIVERSIDE	26175.	16818.	MAY OCT	33139	
		54	TULARE	181280.	95288.	MAY SEP	54568	
1313	FIGS	10	FRESNO	6419.	4560.	APR OCT	10230	10243
		20	MADERA	4185.	2595.	APR OCT	50562	10243
		24	MERCED	1520.	3480.	APR OCT	50562	
1419	GARLIC	10	FRESNO	8100.	61600.	JAN JUL NOV DEC	10230	10243

		15	KERN	2380.	16290.	JAN	JUL	NOV	DEC	15242	15243		
		27	MONTEREY	1020.	7070.	JAN	AUG	NOV	DEC	27544			
		35	SAN BENITO	200.	1160.	JAN	AUG	NOV	DEC	35823			
		43	SANTA CLARA	200.	800.	JAN	AUG	NOV	DEC	35823			
1520	GRAIN HAY	1	ALAMEDA	9500.	13965.	JAN	MAY	DEC		01340			
		3	AMADOR	1110.	2775.	JAN	MAY	DEC		31813			
		4	BUTTE	3000.	7200.	JAN	MAY	DEC		04628			
		5	CALAVERAS	500.	500.	APR	AUG			50562			
		6	COLUSA	3500.	8400.	JAN	MAY	DEC		04628			
		7	CONTRA COSTA	910.	2120.	JAN	MAY	DEC		07440			
		8	DEL NORTE	115.	345.	APR	AUG			23763			
		9	EL DORADO	1200.	2500.	APR	AUG			31813			
		12	HUMBOLT	120.	238.	APR	AUG			23763			
		15	KERN	15000.	38600.	JAN	MAY	DEC		15242	15243		
		16	KINGS	565.	2260.	JAN	MAY	DEC		16701			
		18	LASSEN	9000.	19800.	APR	AUG			45563			
		19	LOS ANGELES	1355.	2544.	JAN	MAY	DEC		19082			
		20	MADERA	1500.	4500.	JAN	MAY	DEC		10243			
		24	MERCED	17200.	60500.	JAN	MAY	DEC		50568			
		25	MODOC	10200.	20400.	APR	AUG			47861			
		27	MONTEREY	2900.	6750.	JAN	MAY	DEC		27544			
		28	NAPA	5977.	12850.	JAN	MAY	DEC		28783			
		30	ORANGE	1940.	1106.	JAN	MAY	DEC		30186			
		31	PLACER	1500.	3000.	APR	AUG			31810	31813		
		32	PLUMAS	2100.	2600.	APR	AUG			04628			
		33	RIVERSIDE	3075.	5642.	JAN	MAY	DEC		33139			
		34	SACRAMENTO	7650.	21400.	JAN	MAY	DEC		57569			
		35	SAN BENITO	26000.	28600.	JAN	MAY	DEC		35823			
		36	SAN BERNARDINO	7220.	19200.	JAN	MAY	DEC		36192	36155	36190	33155
		37	SAN DIEGO	1717.	1889.	JAN	MAY	DEC		37115			
		40	SAN LUIS OBISPO	19000.	57000.	JAN	MAY	DEC		40832	40833	40834	40835
		41	SAN MATEO	2200.	4200.	JAN	MAY	DEC		41541			
		42	SANTA BARBARA	7746.	10999.	JAN	MAY	DEC		42377			
		43	SANTA CLARA	13500.	33750.	JAN	MAY	DEC		35823			
		46	SIERRA	1200.	1320.	APR	AUG			04628			
		48	SOLANO	5000.	13750.	JAN	MAY	DEC		48881			
		49	SONOMA	14500.	41000.	JAN	MAY	DEC		49893			
		50	STANISLAUS	14800.	42800.	JAN	MAY	DEC		50568			
		51	SUTTER	4873.	12575.	JAN	MAY	DEC		04628			
		52	TEHAMA	4000.	9600.	JAN	MAY	DEC		04628			
		53	TRINITY	58.	130.	APR	AUG			23763			
		54	TULARE	1600.	7200.	JAN	MAY	DEC		54568			
		55	TUOLUMNE	230.	345.	JAN	MAY	DEC		50568			
		56	VENTURA	4000.	4000.	JAN	MAY	DEC		56419			
		57	YOLO	9200.	23600.	JAN	MAY	DEC		57569			
		58	YUBA	1501.	3377.	JAN	MAY	DEC		04628			
1220	GRAIN SORGHUM	4	BUTTE	2200.	4800.	JUN	AUG			04628			
		6	COLUSA	3200.	7040.	JUN	AUG			06643			
		10	FRESNO	2200.	4930.	JUN	AUG			10230			
		11	GLENN	2700.	5400.	JUN	AUG			11673			
		13	IMPERIAL	1572.	3883.	APR	JUN			33139			
		15	KERN	4520.	10000.	JUN	AUG			15242	15243		
		16	KINGS	1846.	4578.	JUN	AUG			16701			
		20	MADERA	500.	1000.	JUN	AUG			50562	10243		
		24	MERCED	1260.	2840.	JUN	AUG			50562			
		33	RIVERSIDE	1540.	2402.	APR	JUN			33155	33149		
		34	SACRAMENTO	1700.	4760.	JUN	AUG			34286			
		39	SAN JOAQUIN	1110.	3060.	JUN	AUG			39252	39267		
		48	SOLANO	1500.	4500.	JUN	AUG			48881			
		51	SUTTER	10357.	23488.	JUN	AUG			04628			

		52	TEHAMA	500.	1150.	JUN	AUG	45560	04628	
		54	TULARE	6500.	13500.	JUN	AUG	54568		
		57	YOLO	3800.	8360.	JUN	AUG	57569		
1373	GRAPEFRUIT	13	IMPERIAL	452.	4895.	APR	OCT	33139		
		15	KERN	1563.	9080.	APR	OCT	15242	15243	
		30	ORANGE	101.	1012.	APR	OCT	30186		
		33	RIVERSIDE	14673.	201158.	APR	OCT	33139		
		36	SAN BERNARDINO	1150.	15510.	APR	OCT	36192		
		37	SAN DIEGO	2325.	33713.	APR	OCT	37115		
		54	TULARE	273.	1330.	APR	OCT	54568		
		56	VENTURA	1145.	5983.	APR	OCT	56419	56427	56430
3303	GRAPES-RAISIN	10	FRESNO	166183.	1326140.	APR	OCT	10230	10243	
		15	KERN	29536.	179540.	APR	OCT	15242	15243	
		16	KINGS	2379.	17010.	APR	OCT	16701		
		20	MADERA	39916.	363936.	APR	OCT	50562	10243	
		24	MERCED	3197.	25715.	APR	OCT	50562		
		50	STANISLAUS	2468.	20021.	APR	OCT	50562	50568	
		54	TULARE	38703.	284467.	APR	OCT	54568		
3304	GRAPES-TABLE	10	FRESNO	7475.	48000.	APR	OCT	10230	10243	
		15	KERN	15465.	79500.	APR	OCT	15242	15243	
		16	KINGS	122.	1318.	APR	OCT	16701		
		20	MADERA	680.	2978.	APR	OCT	50562	10243	
		33	RIVERSIDE	12275.	69461.	APR	JUN	33139		
		39	SAN JOAQUIN	17546.	133000.	APR	OCT	39252	39267	
		54	TULARE	26204.	151600.	APR	OCT	54568		
3305	GRAPES-WINE	1	ALAMEDA	1672.	5286.	APR	OCT	01340		
		3	AMADOR	1609.	4641.	APR	OCT	31813		
		5	CALAVERAS	77.	100.	APR	OCT	31813		
		7	CONTRA COSTA	851.	1566.	APR	OCT	07440		
		9	EL DORADO	313.	1377.	APR	OCT	31813		
		10	FRESNO	34434.	298900.	APR	OCT	10230	10243	
		15	KERN	34861.	242160.	APR	OCT	15242	15243	
		16	KINGS	1117.	9774.	APR	OCT	16701		
		17	LAKE	2775.	9901.	APR	OCT	17713		
		20	MADERA	36010.	247389.	APR	OCT	50562	10243	
		23	MENDOCINO	10384.	38626.	APR	OCT	23763		
		24	MERCED	15133.	137000.	APR	OCT	50562		
		27	MONTEREY	29792.	117020.	APR	OCT	27544		
		28	NAPA	24831.	99996.	APR	OCT	28783		
		31	PLACER	129.	265.	APR	OCT	31810	31813	
		33	RIVERSIDE	2661.	10378.	APR	OCT	33149	37134	
		34	SACRAMENTO	4200.	29400.	APR	OCT	34286		
		35	SAN BENITO	4000.	12000.	APR	OCT	35823		
		36	SAN BERNARDINO	6500.	13740.	APR	OCT	36197		
		37	SAN DIEGO	175.	315.	APR	OCT	37115	37134	
		39	SAN JOAQUIN	35920.	242000.	APR	OCT	39252	39267	
		40	SAN LUIS OBISPO	5477.	23551.	APR	OCT	40832	40835	
		42	SANTA BARBARA	8670.	33380.	APR	OCT	42369	42377	
		43	SANTA CLARA	1560.	3900.	APR	OCT	43389		
		44	SANTA CRUZ	103.	160.	APR	OCT	44845		
		48	SOLANO	1054.	5632.	APR	OCT	48881		
		49	SONOMA	26348.	100293.	APR	OCT	49887	49893	
		50	STANISLAUS	16331.	119600.	APR	OCT	50562	50568	
		54	TULARE	14269.	118000.	APR	OCT	54568		
		57	YOLO	969.	6521.	APR	OCT	57569		
1462	HONEYDEW	10	FRESNO	1450.	10900.	APR	JUL	10230	10243	
		13	IMPERIAL	2625.	16721.	APR	JUL	33139		
		33	RIVERSIDE	1331.	8357.	MAY	JUN	33139		
		50	STANISLAUS	3000.	20900.	APR	JUL	50562	50568	
		51	SUTTER	2242.	19765.	APR	JUL	04628		

		57	YOLO	3600.	33910.	APR	JUL			57569			
1371	LEMONS	10	FRESNO	1017.	11930.	APR	OCT			10230	10243		
		13	IMPERIAL	1846.	9544.	APR	OCT			33139			
		15	KERN	3924.	15900.	APR	OCT			15242	15243		
		19	LOS ANGELES	115.	1507.	APR	OCT			19080			
		30	ORANGE	873.	15103.	APR	OCT			30186			
		33	RIVERSIDE	7284.	104351.	APR	OCT			33149	33144	33155	
		36	SAN BERNARDINO	420.	15029.	APR	OCT			36175			
		37	SAN DIEGO	3602.	54030.	APR	OCT			37115	37134		
		40	SAN LUIS OBISPO	830.	14359.	APR	OCT			40834			
		42	SANTA BARBARA	1809.	28492.	APR	OCT			42363	42370		
		54	TULARE	4744.	50800.	APR	OCT			54568			
		56	VENTURA	22620.	280767.	APR	OCT			56419	56427	56430	
1456	LETTUCE	10	FRESNO	13600.	245900.	JAN	APR	AUG	DEC	10230	10243		
		13	IMPERIAL	30667.	407614.	JAN	MAR	SEP	DEC	33139			
		15	KERN	7920.	93390.	JAN	APR	AUG	DEC	15242	15243		
		16	KINGS	729.	11786.	JAN	APR	AUG	DEC	16701			
		27	MONTEREY	71207.	1154207.	JAN	OCT			27544			
		30	ORANGE	674.	7836.	JAN	APR	OCT	DEC	30186			
		33	RIVERSIDE	11283.	143811.	JAN	FEB	SEP	DEC	33139			
		34	SACRAMENTO	50.	300.	JAN	APR	OCT	DEC	57569			
		35	SAN BENITO	1470.	17500.	JAN	OCT			35823			
		36	SAN BERNARDINO	220.	1990.	JAN	FEB	SEP	DEC	33155			
		40	SAN LUIS OBISPO	10795.	156572.	JAN	DEC			40844			
		41	SAN MATEO	190.	1264.	JAN	OCT			41541			
		42	SANTA BARBARA	8800.	135990.	JAN	DEC			42377			
		43	SANTA CLARA	800.	6400.	JAN	OCT			43389			
		44	SANTA CRUZ	4037.	68770.	JAN	OCT			44845			
		56	VENTURA	7686.	90508.	JAN	MAY	SEP	DEC	56419			
1407	LIMAS-GREEN(PROC)	24	MERCED	5360.	7880.	JUN	AUG			50562			
		39	SAN JOAQUIN	1300.	1700.	JUN	AUG			39252	39267		
		50	STANISLAUS	12000.	18200.	JUN	AUG			50562	50568		
		56	VENTURA	11161.	17114.	JUN	AUG			56419			
1314	NECTARINES	7	CONTRA COSTA	34.	85.	APR	JUN			07442			
		10	FRESNO	12074.	112000.	APR	JUN			10230			
		15	KERN	1359.	8190.	APR	JUN			15242	15243		
		16	KINGS	1187.	9342.	APR	JUN			16701			
		20	MADERA	494.	3260.	APR	JUN			50562	10243		
		24	MERCED	214.	1710.	APR	JUN			50562			
		33	RIVERSIDE	102.	141.	APR	JUN			33139			
		50	STANISLAUS	123.	1410.	APR	JUN			50562	50568		
		54	TULARE	7501.	73500.	APR	JUN			54568			
1230	OATS	4	BUTTE	900.	880.	JAN	MAY	NOV	DEC	04628			
		18	LASSEN	700.	720.	APR	AUG			47861			
		20	MADERA	700.	700.	JAN	MAY	NOV	DEC	10243			
		24	MERCED	530.	740.	JAN	MAY	NOV	DEC	50568			
		25	MODOC	1460.	1680.	APR	AUG			47861			
		31	PLACER	1400.	700.	JAN	MAY	NOV	DEC	31810	31813		
		33	RIVERSIDE	6593.	659.	JAN	MAY	NOV	DEC	33149			
		34	SACRAMENTO	900.	900.	JAN	MAY	NOV	DEC	34286			
		39	SAN JOAQUIN	2990.	3400.	JAN	MAY	NOV	DEC	39252			
		41	SAN MATEO	2000.	1400.	JAN	MAY	NOV	DEC	41541			
		42	SANTA BARBARA	400.	152.	JAN	MAY	NOV	DEC	42365	42369	42377	42384
		45	SHASTA	800.	800.	APR	AUG			45560	45563		
		47	SISKIYOU	8500.	14875.	APR	AUG			47861			
		48	SOLANO	2200.	1980.	JAN	MAY	NOV	DEC	48881			
		49	SONOMA	2400.	2800.	JAN	MAY	NOV	DEC	49893			
		50	STANISLAUS	921.	1170.	JAN	MAY	NOV	DEC	50568			
		51	SUTTER	1762.	1973.	JAN	MAY	NOV	DEC	04628			
		52	TEHAMA	800.	800.	JAN	MAY	NOV	DEC	45560	04628		

1310	OLIVES	4	BUTTE	2631.	5770.	APR	SEP		04628			
		5	CALAVERAS	215.	90.	APR	SEP		31813			
		10	FRESNO	1034.	4280.	APR	SEP		10230	10243		
		11	GLENN	1774.	7628.	APR	SEP		11673			
		15	KERN	4808.	15400.	APR	SEP		15242	15243		
		16	KINGS	1146.	4653.	APR	SEP		16701			
		20	MADERA	2176.	9444.	APR	SEP		50562	10243		
		24	MERCED	45.	130.	APR	SEP		50562			
		52	TEHAMA	4625.	9850.	APR	SEP		45560	04628		
		54	TULARE	13459.	28900.	APR	SEP		54568			
4407	ONIONS-DRY(DEHYD)	10	FRESNO	9000.	189000.	JAN	AUG	DEC	10230	10243		
		13	IMPERIAL	4219.	75098.	JAN	JUN	DEC	33139			
		15	KERN	5640.	104000.	JAN	AUG	DEC	15242	15243		
		16	KINGS	960.	16848.	JAN	AUG	DEC	16701			
		25	MODOC	290.	6380.	MAY	OCT		47861			
		27	MONTEREY	275.	6030.	APR	SEP		27544			
		33	RIVERSIDE	1350.	23895.	JAN	JUN	DEC	33139			
		47	SISKIYOU	146.	3212.	MAY	OCT		47861			
4408	ONIONS-DRY(FRESH)	7	CONTRA COSTA	50.	905.	JAN	AUG	DEC	07442			
		10	FRESNO	1712.	20900.	JAN	AUG	DEC	10230	10243		
		13	IMPERIAL	3069.	40204.	JAN	JUN	DEC	33139			
		15	KERN	4150.	87400.	JAN	AUG	DEC	15242	15243		
		19	LOS ANGELES	1477.	31017.	MAY	OCT		19089			
		27	MONTEREY	300.	5400.	MAY	OCT		27544			
		33	RIVERSIDE	914.	16041.	JAN	JUN	DEC	33139			
		35	SAN BENITO	800.	15360.	APR	SEP		35823			
		36	SAN BERNARDINO	72.	540.	JAN	JUN	DEC	36198			
		39	SAN JOAQUIN	1930.	35400.	JAN	AUG	DEC	39252			
		43	SANTA CLARA	325.	4875.	APR	SEP		43389			
1408	ONIONS-DRY(TOTAL)	7	CONTRA COSTA	50.	905.	JAN	AUG		07442			
		10	FRESNO	10712.	209900.	JAN	AUG		10230	10243		
		13	IMPERIAL	7288.	115302.	JAN	JUN		33139			
		15	KERN	9790.	191400.	JAN	AUG		15242	15243		
		16	KINGS	960.	16848.	JAN	AUG		16701			
		19	LOS ANGELES	1477.	31017.	JAN	AUG		19082			
		25	MODOC	290.	6380.	MAY	OCT		47861			
		27	MONTEREY	575.	11430.	APR	SEP		27544			
		33	RIVERSIDE	2264.	39936.	JAN	JUN		33139			
		35	SAN BENITO	800.	15360.	JAN	AUG		35823			
		36	SAN BERNARDINO	72.	540.	JAN	JUN		36190			
		39	SAN JOAQUIN	1930.	35400.	JAN	AUG		39252			
		43	SANTA CLARA	325.	4875.	APR	SEP		43389			
		47	SISKIYOU	146.	3212.	MAY	OCT		47861			
1370	ORANGES	4	BUTTE	237.	2086.	APR	OCT		04628			
		10	FRESNO	20263.	217265.	APR	OCT		10230	10243		
		11	GLENN	938.	7094.	APR	OCT		11673			
		13	IMPERIAL	632.	5024.	APR	OCT		33139			
		15	KERN	21495.	178500.	APR	OCT		15242	15243		
		20	MADERA	3779.	31215.	APR	OCT		50562	10243		
		30	ORANGE	4796.	60339.	APR	OCT		30186			
		33	RIVERSIDE	16460.	168857.	APR	OCT		33144	33149	33155	33139
		36	SAN BERNARDINO	6780.	57563.	APR	OCT		36192			
		37	SAN DIEGO	8795.	101201.	APR	OCT		37115	37134		
		54	TULARE	76765.	856100.	APR	OCT		54568			
		56	VENTURA	15610.	108057.	APR	OCT		56419	56427	56430	
2364	PASTURE-IRR	1	ALAMEDA	380.	0.	FEB	DEC		01340			
		3	AMADOR	1300.	0.	MAY	SEP		31813			
		4	BUTTE	19700.	0.	FEB	SEP		04628			
		5	CALAVERAS	2000.	0.	MAY	SEP		50562			
		6	COLUSA	3000.	0.	FEB	SEP		04628			

		7	CONTRA COSTA	8200.	0.	FEB	SEP	07440		
		8	DEL NORTE	5000.	0.	APR	SEP	47861		
		9	EL DORADO	4750.	0.	MAY	SEP	31813		
		10	FRESNO	50000.	0.	FEB	SEP	10230	10243	
		11	GLENN	22000.	0.	FEB	SEP	04628		
		12	HUMBOLT	19500.	0.	APR	SEP	23763		
		13	IMPERIAL	14725.	0.	FEB	DEC	33139		
		14	INYO	15520.	0.	MAR	SEP	36188	26785	
		15	KERN	8000.	0.	FEB	SEP	15242	15243	
		16	KINGS	13000.	0.	FEB	SEP	16701		
		17	LAKE	4900.	0.	FEB	SEP	17713		
		18	LASSEN	23500.	0.	MAY	SEP	47861		
		20	MADERA	20000.	0.	FEB	SEP	50562	10243	
		21	MARIN	560.	0.	MAY	SEP	21451		
		22	MARIPOSA	700.	0.	MAY	SEP	50562		
		23	MENDOCINO	6250.	0.	FEB	SEP	23763		
		24	MERCED	83000.	0.	FEB	SEP	50562		
		25	MODOC	59500.	0.	MAY	SEP	47861		
		26	MONO	54500.	0.	MAY	SEP	26785		
		27	MONTEREY	500.	0.	FEB	SEP	27544		
		28	NAPA	1200.	0.	FEB	SEP	28783		
		29	NEVADA	13900.	0.	MAY	SEP	31813		
		30	ORANGE	140.	0.	FEB	SEP	30186		
		31	PLACER	26800.	0.	MAY	SEP	31810	31813	
		32	PLUMAS	30900.	0.	MAY	SEP	04628		
		33	RIVERSIDE	14533.	0.	FEB	SEP	33149	33145	33149
		34	SACRAMENTO	30000.	0.	FEB	SEP	34286	34287	
		35	SAN BENITO	1000.	0.	FEB	SEP	35823		
		36	SAN BERNARDINO	6700.	0.	FEB	SEP	36198	36190	36155
		37	SAN DIEGO	980.	0.	FEB	SEP	37134		
		39	SAN JOAQUIN	42500.	0.	FEB	SEP	39252		
		40	SAN LUIS OBISPO	5750.	0.	FEB	SEP	40834		
		41	SAN MATEO	500.	0.	FEB	SEP	41541		
		42	SANTA BARBARA	12601.	0.	FEB	SEP	42377		
		43	SANTA CLARA	2000.	0.	FEB	SEP	35823		
		45	SHASTA	34000.	0.	MAY	SEP	45560	45563	
		46	SIERRA	10600.	0.	MAY	SEP	31813		
		47	SISKIYOU	104000.	0.	MAY	SEP	47861		
		48	SOLANO	21500.	0.	FEB	SEP	48881		
		49	SONOMA	7200.	0.	FEB	SEP	49893		
		50	STANISLAUS	75500.	0.	FEB	SEP	50562	50568	
		51	SUTTER	21500.	0.	FEB	SEP	04628		
		52	TEHAMA	31300.	0.	FEB	SEP	45560	04628	
		53	TRINITY	223.	0.	APR	SEP	23763		
		54	TULARE	17000.	0.	FEB	SEP	54568		
		55	TUOLUMNE	1900.	0.	MAY	SEP	50562		
		57	YOLO	15000.	0.	FEB	SEP	57569		
		58	YUBA	10000.	0.	FEB	SEP	04628		
1302	PEACHES	4	BUTTE	1956.	35208.	MAY	SEP	04628		
		7	CONTRA COSTA	147.	767.	MAY	SEP	07440		
		9	EL DORADO	13.	29.	MAY	SEP	31813		
		10	FRESNO	11019.	115100.	MAY	SEP	10230	10243	
		15	KERN	2107.	16240.	MAY	SEP	15242	15243	
		16	KINGS	2671.	38813.	MAY	SEP	16701		
		19	LOS ANGELES	600.	3300.	MAY	SEP	19082		
		20	MADERA	1631.	10626.	MAY	SEP	50562	10243	
		24	MERCED	4584.	90300.	MAY	SEP	50562		
		31	PLACER	79.	314.	MAY	SEP	31810	31813	
		33	RIVERSIDE	387.	724.	MAY	SEP	33150		
		39	SAN JOAQUIN	3100.	56400.	MAY	SEP	39252	39267	

		48	SOLANO	441.	1580.	MAY	SEP	48881	
		50	STANISLAUS	10827.	187700.	MAY	SEP	50562	50568
		51	SUTTER	8256.	118393.	MAY	SEP	51895	
		52	TEHAMA	83.	405.	MAY	SEP	45560	04628
		54	TULARE	5268.	72900.	MAY	SEP	54568	
		57	YOLO	115.	1035.	MAY	SEP	57569	
		58	YUBA	3505.	69049.	MAY	SEP	04628	
1303	PEARS	7	CONTRA COSTA	283.	2480.	MAY	JUL	07442	
		9	EL DORADO	1425.	4590.	MAY	JUL	31813	
		10	FRESNO	208.	1030.	MAY	JUL	10230	10243
		17	LAKE	5215.	69196.	MAY	JUL	17713	
		19	LOS ANGELES	220.	1320.	MAY	JUL	19082	
		23	MENDOCINO	2883.	49212.	MAY	JUL	23763	
		31	PLACER	248.	817.	MAY	JUL	31810	31813
		34	SACRAMENTO	6500.	116000.	MAY	JUL	34286	
		35	SAN BENITO	490.	2429.	MAY	JUL	35823	
		39	SAN JOAQUIN	733.	10300.	MAY	JUL	39252	39267
		43	SANTA CLARA	380.	3420.	MAY	JUL	43389	
		48	SOLANO	2595.	15544.	MAY	JUL	48881	
		49	SONOMA	317.	731.	MAY	JUL	49887	49893
		50	STANISLAUS	196.	2080.	MAY	JUL	50562	50568
		51	SUTTER	519.	8106.	MAY	JUL	51895	
		54	TULARE	237.	630.	MAY	JUL	54568	
		57	YOLO	522.	6786.	MAY	JUL	57569	
		58	YUBA	1579.	21474.	MAY	JUL	51895	
1355	PISTACHIOS	10	FRESNO	279.	343.	APR	AUG	10230	10243
		15	KERN	12875.	19400.	APR	AUG	15242	15243
		16	KINGS	2674.	3075.	APR	AUG	16701	
		20	MADERA	13186.	8571.	APR	AUG	50562	10243
		24	MERCED	1173.	821.	APR	AUG	50562	
		54	TULARE	1050.	800.	APR	AUG	54568	
1305	PLUMS	9	EL DORADO	110.	517.	APR	JUN	31813	
		10	FRESNO	13992.	111000.	APR	JUN	10230	10243
		15	KERN	2817.	14600.	APR	JUN	15242	15243
		16	KINGS	1486.	8470.	APR	JUN	16701	
		20	MADERA	962.	2482.	APR	JUN	50562	10243
		24	MERCED	145.	519.	APR	JUN	50562	
		31	PLACER	740.	2650.	APR	JUN	31810	31813
		33	RIVERSIDE	104.	74.	APR	JUN	33150	
		48	SOLANO	20.	44.	APR	JUN	48881	
		51	SUTTER	54.	300.	APR	JUN	04628	
		54	TULARE	14062.	118000.	APR	JUN	54568	
1750	POTATOES	12	HUMBOLT	507.	7041.	JUN	SEP	23763	
		14	INYO	70.	805.	JUN	SEP	36188	26785
		15	KERN	29372.	583970.	JAN	JUL	15242	15243
		25	MODOC	6600.	132000.	JUN	SEP	45563	
		26	MONO	96.	1320.	JUN	SEP	26785	
		27	MONTEREY	1440.	29080.	MAY	OCT	27544	
		33	RIVERSIDE	6530.	96431.	MAR	JUL	33141	33149
		37	SAN DIEGO	890.	13172.	MAR	JUL	37115	
		39	SAN JOAQUIN	1140.	19250.	JAN	JUL	39252	39267
		47	SISKIYOU	9625.	192500.	JUN	SEP	47861	
1306	PRUNES	3	AMADOR	62.	156.	APR	AUG	31813	
		4	BUTTE	8143.	17100.	APR	AUG	04628	
		6	COLUSA	4900.	7350.	APR	AUG	06643	
		10	FRESNO	477.	1720.	APR	AUG	10230	10243
		11	GLENN	5042.	12605.	APR	AUG	04628	
		17	LAKE	128.	236.	APR	AUG	17713	
		23	MENDOCINO	219.	334.	APR	AUG	23763	
		24	MERCED	1446.	3410.	APR	AUG	50562	

		35	SAN BENITO	200.	254.	APR AUG	35823
		43	SANTA CLARA	1900.	6650.	APR AUG	43389
		48	SOLANO	2630.	3945.	APR AUG	48881
		49	SONOMA	2835.	4386.	APR AUG	49887 49893
		51	SUTTER	16922.	47889.	APR AUG	04628
		52	TEHAMA	6423.	15740.	APR AUG	45560 04628
		54	TULARE	4355.	9580.	APR AUG	54568
		57	YOLO	2258.	5532.	APR AUG	57569
		58	YUBA	8752.	26256.	APR AUG	04628
1150	RICE	4	BUTTE	89000.	313280.	MAY SEP	04628
		6	COLUSA	118000.	436600.	MAY SEP	06643
		10	FRESNO	10000.	28500.	MAY SEP	10230 10243
		11	GLENN	65124.	244215.	MAY SEP	11673
		15	KERN	1050.	2300.	MAY SEP	15242 15243
		24	MERCED	11600.	43200.	MAY SEP	50562
		31	PLACER	14400.	52600.	MAY SEP	31810 31813
		34	SACRAMENTO	16700.	58500.	MAY SEP	34286 34287
		39	SAN JOAQUIN	5790.	18600.	MAY SEP	39252 39267
		50	STANISLAUS	2552.	7530.	MAY SEP	50562 50568
		51	SUTTER	93198.	355763.	MAY SEP	04628
		52	TEHAMA	2700.	9450.	MAY SEP	45560 45564 04628
		57	YOLO	30287.	110548.	MAY SEP	57569
		58	YUBA	28371.	105824.	MAY SEP	04628
1630	SAFFLOWER	6	COLUSA	6440.	5150.	MAY JUN	06643
		10	FRESNO	7200.	11500.	MAR JUN	10230 10243
		11	GLENN	1574.	1149.	MAY JUN	11673
		16	KINGS	21865.	20334.	MAR JUN	16701
		24	MERCED	2630.	2950.	MAR JUN	50562
		34	SACRAMENTO	5850.	5850.	MAY JUN	10243
		39	SAN JOAQUIN	5690.	8300.	MAY JUN	39252 39267
		40	SAN LUIS OBISPO	1665.	333.	MAY JUN	40834
		48	SOLANO	6200.	6820.	MAY JUN	48881
		51	SUTTER	6717.	7836.	MAY JUN	04628
		57	YOLO	12650.	12650.	MAY JUN	57569
1211	SILAGE-CORN	10	FRESNO	11000.	235000.	MAY JUL	10230 10243
		11	GLENN	3000.	81000.	MAY JUL	11673
		16	KINGS	9981.	209601.	MAY JUL	16701
		18	LASSEN	100.	1800.	MAY JUL	47861
		20	MADERA	5000.	125000.	MAY JUL	50562 10243
		24	MERCED	36700.	807000.	MAY JUL	50562
		27	MONTEREY	300.	8400.	MAY JUL	27544
		33	RIVERSIDE	575.	15238.	APR SEP	33155
		34	SACRAMENTO	7800.	187000.	MAY JUL	34286 34287
		35	SAN BENITO	1700.	38000.	MAY JUL	35823
		36	SAN BERNARDINO	1250.	35000.	APR SEP	33155
		37	SAN DIEGO	251.	2636.	APR SEP	37115
		39	SAN JOAQUIN	21500.	527000.	MAY JUL	39252 39267
		42	SANTA BARBARA	1182.	28474.	MAY JUL	42369 42377
		47	SISKIYOU	760.	19000.	MAY JUL	47861
		49	SONOMA	770.	15600.	MAY JUL	49887 49893
		50	STANISLAUS	44000.	1104000.	MAY JUL	50562 50568
		51	SUTTER	2425.	63414.	MAY JUL	04628
		58	YUBA	2780.	69500.	MAY JUL	04628
1415	SPINACH	27	MONTEREY	2985.	30770.	JAN MAY OCT DEC	27544
		33	RIVERSIDE	68.	520.	JAN MAY OCT DEC	33139
		42	SANTA BARBARA	615.	5560.	JAN MAY OCT DEC	42377
		43	SANTA CLARA	100.	400.	JAN MAY OCT DEC	35823
		50	STANISLAUS	2100.	18900.	JAN MAR OCT DEC	50568
		56	VENTURA	3755.	29237.	JAN MAY OCT DEC	56419
1418	STRAWBERRIES	7	CONTRA COSTA	9.	45.	JAN DEC	07442

		10	FRESNO	247.	2960.	JAN	MAY	OCT	DEC	10230	10243
		19	LOS ANGELES	404.	8390.	JAN	MAY	OCT	DEC	19072	
		27	MONTEREY	3245.	95400.	JAN	DEC			27544	
		33	RIVERSIDE	10.	93.	JAN	MAY	OCT	DEC	33155	
		36	SAN BERNARDINO	180.	5490.	JAN	MAY	OCT	DEC	33155	
		37	SAN DIEGO	1086.	20707.	JAN	MAY	OCT	DEC	37134	
		40	SAN LUIS OBISPO	212.	5088.	JAN	MAY	OCT	DEC	40844	
		42	SANTA BARBARA	1203.	36665.	JAN	MAY	OCT	DEC	42377	
		43	SANTA CLARA	320.	6720.	JAN	DEC			43389	
		44	SANTA CRUZ	2089.	59000.	JAN	MAY	OCT	DEC	44845	
		56	VENTURA	2760.	73490.	JAN	MAY	OCT	DEC	56419	
1721	SUGAR BEETS	4	BUTTE	3800.	82500.	JUN				04628	
		6	COLUSA	5600.	142800.	JUN				06643	
		7	CONTRA COSTA	1240.	31000.	JUN				07442	
		10	FRESNO	17193.	468000.	JUN				10230	10243
		11	GLENN	6733.	164927.	JUN				11673	
		13	IMPERIAL	38102.	947597.	MAR	APR			33139	
		15	KERN	10100.	284000.	JUN				15242	15243
		16	KINGS	1622.	38539.	JUN				16701	
		19	LOS ANGELES	260.	5200.	JUN				19082	
		20	MADERA	2700.	59589.	JUN				50562	10243
		24	MERCED	15900.	380000.	JUN				50562	
		27	MONTEREY	4495.	174710.	JUN				27544	
		34	SACRAMENTO	4000.	88000.	JUN				34286	
		35	SAN BENITO	1200.	33600.	JUN				35823	
		39	SAN JOAQUIN	30700.	775000.	JUN				39252	39267
		40	SAN LUIS OBISPO	761.	18797.	JUN				40834	
		42	SANTA BARBARA	894.	23825.	JUN				42365	42377
		43	SANTA CLARA	475.	16150.	JUN				43389	
		48	SOLANO	21455.	455648.	JUN				48881	
		50	STANISLAUS	3500.	81600.	JUN				50562	50568
		51	SUTTER	4853.	106568.	JUN				04628	
		52	TEHAMA	1600.	43000.	JUN				45560	04628
		54	TULARE	2200.	58100.	JUN				54568	
		56	VENTURA	293.	5890.	JUN				56427	
		57	YOLO	18600.	386694.	JUN				57569	
1459	TOMATOES-FRESH	10	FRESNO	4250.	61600.	MAY	SEP			10230	10243
		12	HUMBOLT	18.	182.	MAY	SEP			23753	23763
		13	IMPERIAL	1462.	11389.	MAY	SEP			33139	
		16	KINGS	344.	5504.	APR	JUL			16701	
		24	MERCED	4010.	50833.	APR	JUL			50562	
		27	MONTEREY	3220.	52630.	APR	JUL			27544	
		30	ORANGE	568.	10923.	MAR	AUG			30186	
		33	RIVERSIDE	250.	845.	MAR	AUG			33139	
		34	SACRAMENTO	164.	1640.	MAY	SEP			34286	
		36	SAN BERNARDINO	11.	155.	MAY	SEP			33155	
		37	SAN DIEGO	2928.	89890.	MAY	SEP			37134	
		39	SAN JOAQUIN	4220.	48200.	MAY	SEP			39252	39267
		43	SANTA CLARA	125.	2625.	MAY	SEP			43389	
		44	SANTA CRUZ	27.	460.	MAY	SEP			44845	
		50	STANISLAUS	1200.	10500.	MAY	SEP			50562	50568
		51	SUTTER	69.	1266.	MAY	SEP			51895	
		54	TULARE	924.	14800.	APR	JUL			54568	
		56	VENTURA	244.	5655.	APR	AUG			56419	
1474	TOMATOES-PROCESSING	6	COLUSA	13400.	321600.	MAY	SEP			06643	
		7	CONTRA COSTA	5420.	138600.	MAY	SEP			07440	
		10	FRESNO	65800.	2060000.	MAY	SEP			10230	10243
		13	IMPERIAL	3785.	122975.	MAY	SEP			33139	
		15	KERN	4550.	140000.	APR	JUL			15242	15243
		16	KINGS	2200.	63140.	MAY	SEP			16701	

		24	MERCED	6160.	178000.	MAY	SEP	50562		
		27	MONTEREY	2100.	64500.	MAY	SEP	27544		
		30	ORANGE	860.	26390.	MAY	SEP	30186		
		33	RIVERSIDE	3190.	87151.	MAY	SEP	33139		
		34	SACRAMENTO	5400.	140000.	MAY	SEP	34286		
		35	SAN BENITO	5550.	184800.	MAY	SEP	35823		
		39	SAN JOAQUIN	25200.	613000.	MAY	SEP	39252	39267	
		42	SANTA BARBARA	1865.	52407.	MAY	SEP	42369		
		43	SANTA CLARA	2700.	81000.	MAY	SEP	43389		
		48	SOLANO	15897.	413322.	MAY	SEP	48881		
		50	STANISLAUS	12250.	347000.	MAY	SEP	50562	50568	
		51	SUTTER	19293.	518017.	MAY	SEP	51895		
		56	VENTURA	4785.	118836.	APR	AUG	56419		
		57	YOLO	49450.	1319000.	MAY	SEP	57569		
1351	WALNUTS	1	ALAMEDA	252.	221.	APR	SEP	01340		
		3	AMADOR	652.	375.	APR	SEP	31813		
		4	BUTTE	11965.	20341.	APR	SEP	04628		
		5	CALAVERAS	731.	210.	APR	SEP	31813		
		6	COLUSA	6000.	6600.	APR	SEP	06643		
		7	CONTRA COSTA	3210.	1810.	APR	SEP	07440		
		9	EL DORADO	458.	132.	APR	SEP	31813		
		10	FRESNO	3173.	4440.	APR	SEP	10230	10243	
		11	GLENN	4585.	5319.	APR	SEP	04628		
		15	KERN	1115.	1390.	APR	SEP	15242	15243	
		16	KINGS	5016.	8326.	APR	SEP	16701		
		17	LAKE	8779.	5224.	APR	SEP	17713		
		20	MADERA	1314.	2181.	APR	SEP	50562	10243	
		23	MENDOCINO	170.	35.	APR	SEP	23763		
		24	MERCED	7428.	10000.	APR	SEP	50562		
		27	MONTEREY	195.	224.	APR	SEP	27544		
		28	NAPA	731.	209.	APR	SEP	28783		
		31	PLACER	642.	675.	APR	SEP	31810	31813	
		33	RIVERSIDE	45.	5.	MAR	SEP	33150		
		34	SACRAMENTO	310.	310.	APR	SEP	34286	34287	
		35	SAN BENITO	4400.	5200.	APR	SEP	35823		
		39	SAN JOAQUIN	25764.	34100.	APR	SEP	39252	39267	
		40	SAN LUIS OBISPO	2975.	1458.	APR	SEP	40832		
		42	SANTA BARBARA	753.	768.	APR	SEP	42369		
		43	SANTA CLARA	1385.	1385.	APR	SEP	43389		
		45	SHASTA	1180.	1800.	APR	SEP	45560	45563	
		48	SOLANO	2296.	2985.	APR	SEP	48881		
		49	SONOMA	581.	172.	APR	SEP	49887	49893	
		50	STANISLAUS	22837.	31700.	APR	SEP	50562	50568	
		51	SUTTER	12548.	16030.	APR	SEP	04628		
		52	TEHAMA	9760.	12000.	APR	SEP	45560	04628	
		54	TULARE	24990.	33000.	APR	SEP	54568		
		56	VENTURA	901.	340.	APR	SEP	56419	56427	56430
		57	YOLO	6348.	9395.	APR	SEP	57569		
		58	YUBA	4964.	7645.	APR	SEP	04628		
1461	WATERMELONS	13	IMPERIAL	4516.	35225.	APR	JUL	33139		
		15	KERN	2020.	36200.	APR	JUL	15242	15243	
		16	KINGS	184.	3864.	APR	JUL	16701		
		24	MERCED	1480.	26900.	APR	JUL	50562		
		33	RIVERSIDE	2244.	19141.	APR	JUL	33139	33149	
		39	SAN JOAQUIN	1820.	39200.	APR	JUL	39252	39267	
		50	STANISLAUS	1000.	11100.	APR	JUL	50562	50568	
1111	WHEAT	1	ALAMEDA	3450.	4105.	FEB	MAY	01340		
		3	AMADOR	700.	1260.	FEB	MAY	31813		
		4	BUTTE	17000.	32000.	FEB	MAY	04628		
		6	COLUSA	22000.	46200.	FEB	MAY	04628		

		7	CONTRA COSTA	6650.	11000.	FEB	MAY	07440			
		10	FRESNO	75000.	214000.	FEB	MAY	10230	10243		
		11	GLENN	25000.	47500.	FEB	MAY	04628			
		13	IMPERIAL	126332.	363836.	JAN	APR	33139			
		15	KERN	42600.	117000.	FEB	MAY	15242	15243		
		16	KINGS	51962.	163161.	FEB	MAY	16701			
		17	LAKE	350.	480.	FEB	MAY	17713			
		18	LASSEN	2500.	2880.	APR	AUG	47861			
		19	LOS ANGELES	4104.	1037.	FEB	MAY	19082			
		20	MADERA	30000.	88800.	FEB	MAY	10243			
		24	MERCED	20500.	48200.	FEB	MAY	50568			
		25	MODOC	2440.	5705.	APR	AUG	47861			
		27	MONTEREY	2345.	1760.	FEB	MAY	27544			
		31	PLACER	1700.	1500.	FEB	MAY	31810	31813		
		33	RIVERSIDE	25737.	47871.	FEB	MAY	33144	33149	33137	33139
		34	SACRAMENTO	22000.	48400.	FEB	MAY	34287	57569		
		35	SAN BENITO	3300.	4950.	FEB	MAY	35823			
		37	SAN DIEGO	1100.	550.	FEB	MAY	37115			
		39	SAN JOAQUIN	38000.	95400.	FEB	MAY	39252			
		40	SAN LUIS OBISPO	22000.	11000.	FEB	MAY	40832	40834	40835	40844
		42	SANTA BARBARA	5365.	5150.	FEB	MAY	42377			
		43	SANTA CLARA	4000.	16000.	FEB	MAY	35823			
		45	SHASTA	1300.	2300.	FEB	MAY	47861			
		47	SISKIYOU	15318.	43672.	APR	AUG	47861			
		48	SOLANO	49000.	127400.	FEB	MAY	48881			
		50	STANISLAUS	5000.	11400.	FEB	MAY	50568			
		51	SUTTER	59000.	112690.	FEB	MAY	04628			
		52	TEHAMA	8000.	14400.	FEB	MAY	04628			
		54	TULARE	47000.	128000.	FEB	MAY	54568			
		57	YOLO	68000.	163200.	FEB	MAY	57569			
		58	YUBA	2622.	5218.	FEB	MAY	04628			
1118	WHEAT-DRYLAND	1	ALAMEDA	2200.	3000.	FEB	MAY	01340			
		3	AMADOR	200.	210.	FEB	MAY	31813			
		4	BUTTE	13000.	18660.	FEB	MAY	04628			
		6	COLUSA	4500.	6270.	FEB	MAY	04628			
		7	CONTRA COSTA	1000.	1380.	FEB	MAY	07440			
		10	FRESNO	4500.	6750.	FEB	MAY	10230	10243		
		11	GLENN	2200.	3810.	FEB	MAY	04628			
		13	IMPERIAL	1000.	2010.	JAN	APR	33139			
		15	KERN	4000.	8190.	FEB	MAY	15242	15243		
		16	KINGS	400.	900.	FEB	MAY	16701			
		17	LAKE	400.	540.	FEB	MAY	17713			
		18	LASSEN	1800.	1860.	APR	AUG	47861			
		20	MADERA	400.	600.	FEB	MAY	10243			
		24	MERCED	600.	900.	FEB	MAY	50568			
		25	MODOC	1400.	2250.	APR	AUG	47861			
		27	MONTEREY	400.	240.	FEB	MAY	40832			
		28	NAPA	200.	240.	FEB	MAY	28783			
		31	PLACER	800.	330.	FEB	MAY	31810	31813		
		33	RIVERSIDE	6900.	4830.	FEB	MAY	33144	33149	33137	33139
		34	SACRAMENTO	5500.	9690.	FEB	MAY	34287	57569		
		35	SAN BENITO	700.	930.	FEB	MAY	35823			
		36	SAN BERNARDINO	500.	750.	FEB	MAY	36192	36190	36155	33155
		37	SAN DIEGO	1000.	1200.	FEB	MAY	37115			
		39	SAN JOAQUIN	9000.	16200.	FEB	MAY	39252			
		40	SAN LUIS OBISPO	21000.	26730.	FEB	MAY	40832	40834	40835	40844
		42	SANTA BARBARA	4400.	3720.	FEB	MAY	42377			
		43	SANTA CLARA	200.	330.	FEB	MAY	35823			
		45	SHASTA	400.	720.	FEB	MAY	47861			
		46	SIERRA	200.	180.	FEB	MAY	31813			

		47	SISKIYOU	5200.	4410.	APR	AUG	47861			
		48	SOLANO	6200.	9270.	FEB	MAY	48881			
		49	SONOMA	300.	450.	FEB	MAY	49893			
		50	STANISLAUS	1300.	1170.	FEB	MAY	50568			
		51	SUTTER	12100.	19950.	FEB	MAY	04628			
		52	TEHAMA	3800.	3690.	FEB	MAY	04628			
		54	TULARE	22500.	27840.	FEB	MAY	54568			
		57	YOLO	32500.	44280.	FEB	MAY	57569			
		58	YUBA	300.	360.	FEB	MAY	04628			
1119	WHEAT-IRRIGATED	1	ALAMEDA	1500.	3180.	FEB	MAY	01340			
		3	AMADOR	400.	390.	FEB	MAY	31813			
		4	BUTTE	4500.	10140.	FEB	MAY	04628			
		6	COLUSA	17500.	40530.	FEB	MAY	04628			
		7	CONTRA COSTA	6000.	15840.	FEB	MAY	07440			
		10	FRESNO	70500.	207000.	FEB	MAY	10230	10243		
		11	GLENN	20800.	43800.	FEB	MAY	04628			
		13	IMPERIAL	149000.	429630.	JAN	APR	33139			
		15	KERN	45000.	118800.	FEB	MAY	15242	15243		
		16	KINGS	34600.	87300.	FEB	MAY	16701			
		18	LASSEN	800.	1200.	APR	AUG	47861			
		19	LOS ANGELES	2500.	2190.	FEB	MAY	19082			
		20	MADERA	26600.	71490.	FEB	MAY	10243			
		24	MERCED	19400.	47100.	FEB	MAY	50568			
		25	MODOC	900.	1830.	APR	AUG	47861			
		27	MONTEREY	2000.	3000.	FEB	MAY	27544	40832		
		28	NAPA	200.	300.	FEB	MAY	28783			
		31	PLACER	900.	690.	FEB	MAY	31810	31813		
		33	RIVERSIDE	5600.	13920.	FEB	MAY	33144	33149	33137	33139
		34	SACRAMENTO	18500.	51510.	FEB	MAY	34287	57569		
		35	SAN BENITO	700.	1800.	FEB	MAY	35823			
		36	SAN BERNARDINO	500.	1650.	FEB	MAY	36192	36190	36155	33155
		39	SAN JOAQUIN	38000.	96600.	FEB	MAY	39267			
		40	SAN LUIS OBISPO	4500.	8100.	FEB	MAY	40832	40834	40835	40844
		42	SANTA BARBARA	1600.	2580.	FEB	MAY	42377			
		43	SANTA CLARA	800.	1920.	FEB	MAY	35823			
		45	SHASTA	900.	1830.	FEB	MAY	47861			
		47	SISKIYOU	6000.	11040.	APR	AUG	47861			
		48	SOLANO	11800.	31770.	FEB	MAY	48881			
		50	STANISLAUS	5700.	13110.	FEB	MAY	50568			
		51	SUTTER	46900.	119880.	FEB	MAY	04628			
		52	TEHAMA	4200.	10710.	FEB	MAY	04628			
		54	TULARE	24500.	76500.	FEB	MAY	54568			
		57	YOLO	35500.	88320.	FEB	MAY	57569			
		58	YUBA	2200.	4710.	FEB	MAY	04628			

APPENDIX B

Crop Harvested Tons

Growing Season Ozone Exposures
(pphm x hrs >10 pphm, 0900-1600 7-hr mean in pphm,
0800-2000 12-hr mean in pphm)

Crop Loss Indexes

Potential Crop Harvested Tons

Statewide Crop Loss for Each Crop in Each County
of California in 1984

Column 1:	Crop name
Column 2:	County name
Column 3:	Crop tons harvested per county. The total statewide tonnage is given at the bottom of the column for each crop.
Column 4:	pphm x hrs >10 pphm for growing season (peak sensitivity).
Column 5:	0900-1559 PST 7-hr mean in pphm for growing season (peak sensitivity).
Column 6:	0800-1959 PST 12-hr mean in pphm for growing season (peak sensitivity).
Columns 7-10:	Percentage crop yield loss for each county and crop based on up to four different models. The primary author for a publication describing the model is indicated at the top of the column. If there was no model available for the crop the index for each county was set at 0. For barley, sorghum, strawberry, sugar beets, Olszyk-lettuce, and Olszyk-wheat, the models indicated that ozone had no effect on yield, thus, the loss also was set at 0. Numbers less than 0 indicate that the ozone levels were below 2.5 pphm.
Columns 11-14:	Potential crop tonnage in each county if ozone was not present above background levels, i.e., 0 pphm x hrs >10 pphm, or 2.5 pphm during 7- or 12-hr period. Potential tonnage for each county was calculated as crop tons/crop loss index. The primary author for the model is indicated at the top of the column. If indexes were >1.0 the potential yield was assumed to be the same as the actual 1984 yield. The total potential statewide crop tonnage is given next to last at the bottom of the column for each crop. The estimated statewide crop loss from ozone for each crop is given as the Total/Potential value at the bottom of each column.

INDEXTON,99FFHM

17-JUL-86 BASE= 2.5 BASET=523.5 STANDARD=

CROP	COUNTY	TONS	OZONE DOSE >10	OZONE DOSE 7HR	OZONE DOSE 12HR	ESTIMATED % YIELD LOSS EQUATION (1)	(2)	(3)	(4)	POTENTIAL TONS = TONS/INDEX (1)	(2)	(3)	(4)
ALFALFA HAY	ALAMEDA	6205	90.0	4.4	3.5	4.9	0.8	4.0	3.0	6522	6257	6465	6395
ALFALFA HAY	AMADOR	1237	46.0	5.9	5.7	15.0	0.4	12.4	10.4	1455	1242	1412	1381
ALFALFA HAY	BUTTE	24500	0.0	3.5	3.2	3.3	0.0	2.8	2.0	25345	24500	25194	24997
ALFALFA HAY	COLUSA	32200	0.0	3.5	3.2	3.3	0.0	2.8	2.0	33310	32200	33113	32854
ALFALFA HAY	CONTRA COSTA	11000	31.0	3.8	3.1	2.7	0.3	2.2	1.6	11307	11032	11253	11179
ALFALFA HAY	FRESNO	720000	231.0	6.8	6.1	17.2	2.1	14.3	12.3	869964	735734	839674	820518
ALFALFA HAY	GLENN	113850	0.0	3.5	3.2	3.3	0.0	2.8	2.0	117776	113850	117077	116162
ALFALFA HAY	HUMBOLDT	763	0.0	3.0	2.7	0.9	0.0	0.7	0.5	770	763	769	767
ALFALFA HAY	IMPERIAL	1481392	371.0	5.1	4.5	9.6	3.4	7.9	6.3	1638189	1534083	1608699	1580499
ALFALFA HAY	INYO	28560	0.0	4.8	4.8	10.8	0.0	8.9	7.2	32004	28560	31349	30761
ALFALFA HAY	KERN	661000	183.0	5.7	5.1	12.4	1.7	10.3	8.4	754811	672392	736703	721794
ALFALFA HAY	KINGS	207007	15.0	4.9	4.6	10.0	0.1	8.2	6.6	229886	207295	225568	221520
ALFALFA HAY	LAKE	3960	0.0	3.6	3.4	4.5	0.0	3.7	2.7	4146	3960	4112	4071
ALFALFA HAY	LASSEN	101200	0.0	4.1	3.8	6.0	0.0	5.0	3.7	107660	101200	106482	105133
ALFALFA HAY	LOS ANGELES	99589	668.0	6.4	6.2	17.4	6.2	14.4	12.4	120540	106154	116302	113644
ALFALFA HAY	MADERA	253080	175.0	6.4	5.8	16.0	1.6	13.2	11.2	301114	257248	291531	285017
ALFALFA HAY	MERCED	437300	82.0	4.8	4.5	9.5	0.8	7.8	6.2	483077	440645	474475	466208
ALFALFA HAY	MODOC	126450	0.0	4.1	3.8	6.0	0.0	5.0	3.7	134521	126450	133050	131364
ALFALFA HAY	MONO	45356	0.0	4.7	4.8	11.0	0.0	9.1	7.3	50962	45356	49894	48946
ALFALFA HAY	MONTEREY	63700	0.0	3.0	2.6	0.6	0.0	0.5	0.3	64066	63700	64002	63907
ALFALFA HAY	PLUMAS	16830	46.0	5.9	5.7	15.0	0.4	12.4	10.4	19800	16902	19213	18792
ALFALFA HAY	RIVERSIDE	395984	1281.7	7.1	6.3	17.9	11.9	14.8	12.8	482346	449296	464790	454100
ALFALFA HAY	SACRAMENTO	32200	293.0	5.6	5.0	11.9	2.7	9.8	8.0	36532	33098	35700	34994
ALFALFA HAY	SAN BENITO	13800	0.0	4.4	3.9	6.8	0.0	5.6	4.3	14801	13800	14617	14415
ALFALFA HAY	SAN BERNARDINO	188000	896.0	6.7	6.2	17.4	8.3	14.4	12.4	227550	205006	219551	214533
ALFALFA HAY	SAN JOAQUIN	328000	19.0	4.6	4.0	7.1	0.2	5.9	4.5	353231	328578	348586	343559
ALFALFA HAY	SAN LUIS OBISPO	56070	3.0	3.6	3.3	3.7	0.0	3.0	2.2	58204	56086	57823	57332
ALFALFA HAY	SANTA BARBARA	48308	0.0	3.0	2.6	0.6	0.0	0.5	0.4	48609	48308	48557	48478
ALFALFA HAY	SANTA CLARA	3000	0.0	4.4	3.9	6.8	0.0	5.6	4.3	3218	3000	3178	3134
ALFALFA HAY	SHASTA	97500	0.0	4.2	3.9	6.7	0.0	5.6	4.2	104518	97500	103231	101807
ALFALFA HAY	SIERRA	3150	46.0	5.9	5.7	15.0	0.4	12.4	10.4	3706	3163	3596	3517
ALFALFA HAY	SISKIYOU	360000	0.0	4.1	3.8	6.0	0.0	5.0	3.7	382978	360000	378791	373990
ALFALFA HAY	SOLANO	56000	0.0	2.1	1.7	-3.7	0.0	-3.0	-1.9	56000	56000	56000	56000
ALFALFA HAY	STANISLAUS	164000	82.0	4.8	4.5	9.5	0.8	7.8	6.2	181168	165255	177942	174841
ALFALFA HAY	SUTTER	33916	0.0	3.5	3.2	3.3	0.0	2.8	2.0	35086	33916	34877	34605
ALFALFA HAY	TEHAMA	28300	0.0	3.5	3.2	3.3	0.0	2.8	2.0	29276	28300	29102	28875
ALFALFA HAY	TRINITY	440	0.0	3.0	2.7	0.9	0.0	0.7	0.5	444	440	443	442
ALFALFA HAY	TULARE	763000	68.0	5.9	5.3	13.4	0.6	11.1	9.2	880867	767834	857914	839955
ALFALFA HAY	VENTURA	2650	72.0	5.7	4.8	10.9	0.7	9.0	7.2	2973	2668	2911	2856
ALFALFA HAY	YOLO	136640	24.0	4.7	4.2	8.0	0.2	6.6	5.1	148445	136944	146256	143983
ALFALFA HAY	YUBA	5016	0.0	3.5	3.2	3.3	0.0	2.8	2.0	5189	5016	5158	5118
	STATEWIDE	7151153								8062366	7323731	7885360	7747443
	STATEWIDE/POTENTIAL									0.887	0.976	0.907	0.924
ALFALFA SEED	FRESNO	18190	231.0	6.8	6.1	17.2	2.1	14.3	12.3	21979	18588	21213	20729
ALFALFA SEED	GLENN	124	0.0	3.5	3.2	3.3	0.0	2.8	2.0	128	124	128	127
ALFALFA SEED	IMPERIAL	1597	371.0	6.3	5.8	15.8	3.4	13.0	11.1	1896	1654	1836	1795
ALFALFA SEED	KINGS	9555	15.0	4.9	4.6	10.0	0.1	8.2	6.6	10611	9568	10412	10225
ALFALFA SEED	LASSEN	69	0.0	4.1	3.8	6.0	0.0	5.0	3.7	73	69	73	72
ALFALFA SEED	LOS ANGELES	23	665.0	7.6	7.4	23.2	6.2	19.2	17.3	30	25	28	28
ALFALFA SEED	SOLANO	1	0.0	2.4	2.0	-2.3	0.0	-1.9	-1.2	1	1	1	1
ALFALFA SEED	SUTTER	9	0.0	4.0	3.7	5.7	0.0	4.7	3.5	10	9	9	9

	STATEWIDE	29568					34728	30038	33700	32960
	STATEWIDE/POTENTIAL						0.851	0.984	0.877	0.896
ALMONDS	BUTTE	28016	0.0	3.3	3.1	0.0	28016			
ALMONDS	COLUSA	5425	0.0	3.3	3.1	0.0	5425			
ALMONDS	CONTRA COSTA	375	15.0	3.6	3.0	0.0	375			
ALMONDS	FRESNO	24700	171.0	6.5	6.0	0.0	24700			
ALMONDS	GLENN	6824	0.0	3.3	3.1	0.0	6824			
ALMONDS	KERN	65400	28.0	4.8	4.3	0.0	65400			
ALMONDS	KINGS	3640	13.0	4.7	4.4	0.0	3640			
ALMONDS	LAKE	11	0.0	3.6	3.5	0.0	11			
ALMONDS	MADERA	14982	110.0	6.1	5.6	0.0	14982			
ALMONDS	MERCED	48400	72.0	4.7	4.3	0.0	48400			
ALMONDS	SAN JOAQUIN	26200	9.0	4.3	3.8	0.0	26200			
ALMONDS	SAN LUIS OBISPO	251	0.0	3.5	3.1	0.0	251			
ALMONDS	SOLANO	1145	0.0	2.1	1.8	0.0	1145			
ALMONDS	STANISLAUS	48545	72.0	4.7	4.3	0.0	48545			
ALMONDS	SUTTER	3712	0.0	3.3	3.1	0.0	3712			
ALMONDS	TEHAMA	3145	0.0	3.3	3.1	0.0	3145			
ALMONDS	TULARE	7610	49.0	5.6	5.1	0.0	7610			
ALMONDS	YOLO	3900	17.0	4.4	4.0	0.0	3900			
ALMONDS	YUBA	1230	0.0	3.3	3.1	0.0	1230			
	STATEWIDE	293511					293511			
	STATEWIDE/POTENTIAL						1.000			
APPLES	BUTTE	1776	0.0	3.6	3.4	0.0	1776			
APPLES	CALAVERAS	490	225.0	5.9	5.4	0.0	490			
APPLES	EL DORADO	4220	46.0	5.4	5.1	0.0	4220			
APPLES	HUMBOLDT	133	0.0	2.8	2.5	0.0	133			
APPLES	KERN	7720	185.5	6.1	5.4	0.0	7720			
APPLES	MADERA	1862	173.0	6.9	6.2	0.0	1862			
APPLES	MARIPOSA	438	15.0	4.6	4.8	0.0	438			
APPLES	MENDOCINO	6215	0.0	2.8	2.5	0.0	6215			
APPLES	MONTEREY	6625	0.0	2.9	2.5	0.0	6625			
APPLES	NEVADA	42	46.0	5.4	5.1	0.0	42			
APPLES	PLACER	253	59.5	5.2	4.8	0.0	253			
APPLES	RIVERSIDE	64	1064.0	5.4	5.4	0.0	64			
APPLES	SAN BENITO	4455	0.0	4.6	4.0	0.0	4455			
APPLES	SAN BERNARDINO	370	3439.0	9.1	8.1	0.0	370			
APPLES	SAN DIEGO	432	219.0	6.4	5.6	0.0	432			
APPLES	SAN JOAQUIN	9050	79.5	5.2	4.6	0.0	9050			
APPLES	SAN LUIS OBISPO	918	7.0	3.7	3.3	0.0	918			
APPLES	SANTA CRUZ	82252	0.0	3.6	3.1	0.0	82252			
APPLES	SISKIYOU	271	0.0	3.8	3.4	0.0	271			
APPLES	SONOMA	71913	1.0	3.4	2.9	0.0	71913			
APPLES	SUTTER	2157	6.0	4.6	4.2	0.0	2157			
APPLES	TUOLUMNE	310	225.0	5.9	5.4	0.0	310			
	STATEWIDE	201966					201966			
	STATEWIDE/POTENTIAL						1.000			
APRICOTS	CONTRA COSTA	5990	2.0	3.7	3.2	0.0	5990			
APRICOTS	FRESNO	2190	66.5	6.8	6.3	0.0	2190			
APRICOTS	KERN	1490	1.0	4.2	3.9	0.0	1490			
APRICOTS	KINGS	1850	3.0	4.7	4.4	0.0	1850			
APRICOTS	MERCED	10400	18.0	5.4	5.1	0.0	10400			
APRICOTS	RIVERSIDE	414	300.0	7.0	6.4	0.0	414			
APRICOTS	SAN BENITO	13000	0.0	4.9	4.5	0.0	13000			
APRICOTS	SAN JOAQUIN	24000	2.5	4.4	4.0	0.0	24000			
APRICOTS	SANTA CLARA	2000	9.0	4.5	3.9	0.0	2000			
APRICOTS	SOLANO	5148	0.0	2.5	2.1	0.0	5148			

APRICOTS	STANISLAUS	70200	13.5	5.1	4.8	0.0	70200
APRICOTS	TULARE	1710	1.0	5.5	5.0	0.0	1710
APRICOTS	YOLO	2592	0.0	4.4	4.1	0.0	2592
	STATEWIDE	140984					140984
	STATEWIDE/POTENTIAL						1.000
ASPARAGUS	CONTRA COSTA	2353	27.0	5.3	4.7	0.0	2353
ASPARAGUS	IMPERIAL	2340	302.0	6.8	6.3	0.0	2340
ASPARAGUS	MONTEREY	5445	0.0	2.8	2.5	0.0	5445
ASPARAGUS	ORANGE	1433	125.0	5.8	4.9	0.0	1433
ASPARAGUS	RIVERSIDE	2417	367.0	6.8	6.3	0.0	2417
ASPARAGUS	SACRAMENTO	2660	2.0	4.0	3.7	0.0	2660
ASPARAGUS	SAN JOAQUIN	26200	77.0	6.0	5.3	0.0	26200
ASPARAGUS	SOLANO	592	0.0	2.3	1.9	0.0	592
ASPARAGUS	YOLO	1151	24.0	5.5	4.9	0.0	1151
	STATEWIDE	44591					44591
	STATEWIDE/POTENTIAL						1.000
AVOCADOS	FRESNO	346	228.5	7.3	6.6	0.0	346
AVOCADOS	KERN	116	185.5	6.5	5.8	0.0	116
AVOCADOS	LOS ANGELES	200	1036.0	7.2	5.5	0.0	200
AVOCADOS	ORANGE	7930	1044.0	7.4	5.8	0.0	7930
AVOCADOS	RIVERSIDE	35318	1200.3	7.8	6.7	0.0	35318
AVOCADOS	SAN BERNARDINO	510	3382.0	9.7	8.6	0.0	510
AVOCADOS	SAN DIEGO	160574	169.0	6.4	5.5	0.0	160574
AVOCADOS	SAN LUIS OBISPO	1812	0.5	3.8	3.5	0.0	1812
AVOCADOS	SANTA BARBARA	27521	8.0	4.7	4.2	0.0	27521
AVOCADOS	SANTA CRUZ	30	0.0	3.5	3.0	0.0	30
AVOCADOS	TULARE	1860	68.0	6.4	5.8	0.0	1860
AVOCADOS	VENTURA	52070	43.7	5.8	5.0	0.0	52070
	STATEWIDE	288287					288287
	STATEWIDE/POTENTIAL						1.000
BARLEY	ALAMEDA	1503	9.0	2.9	2.3	0.0	1503
BARLEY	AMADOR	247	8.0	4.4	4.2	0.0	247
BARLEY	BUTTE	7600	0.0	2.3	2.1	0.0	7600
BARLEY	COLUSA	4200	0.0	2.3	2.1	0.0	4200
BARLEY	CONTRA COSTA	1260	2.0	2.4	1.9	0.0	1260
BARLEY	FRESNO	113000	67.5	4.8	4.3	0.0	113000
BARLEY	GLENN	2700	0.0	2.3	2.1	0.0	2700
BARLEY	IMPERIAL	1176	101.0	4.7	4.0	0.0	1176
BARLEY	KERN	37700	1.0	3.3	3.0	0.0	37700
BARLEY	KINGS	32587	3.0	3.4	3.1	0.0	32587
BARLEY	LAKE	540	0.0	2.9	2.8	0.0	540
BARLEY	LASSEN	4992	0.0	4.4	4.0	0.0	4992
BARLEY	LOS ANGELES	1096	106.0	4.1	3.8	0.0	1096
BARLEY	MADERA	13000	34.0	4.2	3.7	0.0	13000
BARLEY	MERCED	15900	9.0	3.1	2.9	0.0	15900
BARLEY	MODOC	50920	0.0	4.4	4.0	0.0	50920
BARLEY	MONTEREY	36000	0.0	2.7	2.4	0.0	36000
BARLEY	RIVERSIDE	3988	405.0	5.0	4.4	0.0	3988
BARLEY	SACRAMENTO	4380	0.0	3.2	2.9	0.0	4380
BARLEY	SAN BENITO	11070	0.0	3.7	3.4	0.0	11070
BARLEY	SAN BERNARDINO	2280	610.5	5.1	4.4	0.0	2280
BARLEY	SAN JOAQUIN	9570	0.0	2.7	2.3	0.0	9570
BARLEY	SAN LUIS OBISPO	108570	0.0	3.2	2.9	0.0	108570
BARLEY	SAN MATEO	800	1.0	2.4	2.1	0.0	800
BARLEY	SANTA BARBARA	1261	0.0	2.7	2.3	0.0	1261
BARLEY	SANTA CLARA	6000	0.0	3.7	3.4	0.0	6000
BARLEY	SHASTA	3200	0.0	4.3	4.0	0.0	3200

BARLEY	SISKIYOU	113610	0.0	4.4	4.0	0.0	113610
BARLEY	SOLANO	5355	0.0	1.6	1.3	0.0	5355
BARLEY	STANISLAUS	3800	9.0	3.1	2.9	0.0	3800
BARLEY	SUTTER	10697	0.0	2.3	2.1	0.0	10697
BARLEY	TEHAMA	1785	0.0	2.3	2.1	0.0	1785
BARLEY	TULARE	55500	1.0	3.9	3.4	0.0	55500
BARLEY	YOLO	12350	0.0	3.2	2.9	0.0	12350
	STATEWIDE	678637					678637
	STATEWIDE/POTENTIAL						1.000
BARLEY-DRYLAND	ALAMEDA	2760	9.0	2.9	2.3	0.0	2760
BARLEY-DRYLAND	ALPINE	72	0.0	3.4	3.3	0.0	72
BARLEY-DRYLAND	AMADOR	240	8.0	4.4	4.2	0.0	240
BARLEY-DRYLAND	BUTTE	3192	0.0	2.3	2.1	0.0	3192
BARLEY-DRYLAND	COLUSA	792	0.0	2.3	2.1	0.0	792
BARLEY-DRYLAND	CONTRA COSTA	576	2.0	2.4	1.9	0.0	576
BARLEY-DRYLAND	EL DORADO	408	8.0	4.4	4.2	0.0	408
BARLEY-DRYLAND	FRESNO	5712	67.5	4.8	4.3	0.0	5712
BARLEY-DRYLAND	GLENN	5688	0.0	2.3	2.1	0.0	5688
BARLEY-DRYLAND	INYO	2424	0.0	3.5	3.4	0.0	2424
BARLEY-DRYLAND	KERN	12144	1.0	3.3	3.0	0.0	12144
BARLEY-DRYLAND	KINGS	7272	3.0	3.4	3.1	0.0	7272
BARLEY-DRYLAND	LAKE	120	0.0	2.9	2.8	0.0	120
BARLEY-DRYLAND	LASSEN	192	0.0	4.4	4.0	0.0	192
BARLEY-DRYLAND	LOS ANGELES	1056	106.0	4.1	3.8	0.0	1056
BARLEY-DRYLAND	MADERA	1200	34.0	4.2	3.7	0.0	1200
BARLEY-DRYLAND	MARIPOSA	72	9.0	3.1	2.9	0.0	72
BARLEY-DRYLAND	MENDOCINO	384	0.0	1.9	1.8	0.0	384
BARLEY-DRYLAND	MERCED	6600	9.0	3.1	2.9	0.0	6600
BARLEY-DRYLAND	MODOC	2208	0.0	4.4	4.0	0.0	2208
BARLEY-DRYLAND	MONTEREY	35520	0.0	2.7	2.4	0.0	35520
BARLEY-DRYLAND	ORANGE	1152	84.0	4.3	3.6	0.0	1152
BARLEY-DRYLAND	PLACER	96	4.5	3.7	3.4	0.0	96
BARLEY-DRYLAND	RIVERSIDE	7032	405.0	5.0	4.4	0.0	7032
BARLEY-DRYLAND	SACRAMENTO	240	0.0	3.2	2.9	0.0	240
BARLEY-DRYLAND	SAN BENITO	5640	0.0	3.7	3.4	0.0	5640
BARLEY-DRYLAND	SAN BERNARDINO	480	610.5	5.1	4.4	0.0	480
BARLEY-DRYLAND	SAN DIEGO	2568	43.5	4.8	4.1	0.0	2568
BARLEY-DRYLAND	SAN JOAQUIN	720	0.0	2.7	2.3	0.0	720
BARLEY-DRYLAND	SAN LUIS OBISPO	96264	0.0	3.2	2.9	0.0	96264
BARLEY-DRYLAND	SAN MATEO	792	1.0	2.4	2.1	0.0	792
BARLEY-DRYLAND	SANTA BARBARA	264	0.0	2.7	2.3	0.0	264
BARLEY-DRYLAND	SANTA CLARA	1920	0.0	3.7	3.4	0.0	1920
BARLEY-DRYLAND	SISKIYOU	34560	0.0	4.4	4.0	0.0	34560
BARLEY-DRYLAND	SOLANO	6048	0.0	1.6	1.3	0.0	6048
BARLEY-DRYLAND	STANISLAUS	4536	9.0	3.1	2.9	0.0	4536
BARLEY-DRYLAND	SUTTER	3360	0.0	2.3	2.1	0.0	3360
BARLEY-DRYLAND	TEHAMA	768	0.0	2.3	2.1	0.0	768
BARLEY-DRYLAND	TULARE	7440	1.0	3.9	3.4	0.0	7440
BARLEY-DRYLAND	TUOLUMNE	96	9.0	3.1	2.9	0.0	96
BARLEY-DRYLAND	VENTURA	1800	19.0	4.3	3.7	0.0	1800
BARLEY-DRYLAND	YOLO	8592	0.0	3.2	2.9	0.0	8592
BARLEY-DRYLAND	YUBA	288	0.0	2.3	2.1	0.0	288
	STATEWIDE	273288					273288
	STATEWIDE/POTENTIAL						1.000
BARLEY-IRRIGAT	ALAMEDA	720	9.0	2.9	2.3	0.0	720
BARLEY-IRRIGAT	BUTTE	288	0.0	2.3	2.1	0.0	288
BARLEY-IRRIGAT	CALAVERAS	120	8.0	4.4	4.2	0.0	120
BARLEY-IRRIGAT	COLUSA	3432	0.0	2.3	2.1	0.0	3432

BARLEY-IRRIGAT	FRESNO	107568	67.5	4.8	4.3	0.0		107568	
BARLEY-IRRIGAT	GLENN	1344	0.0	2.3	2.1	0.0		1344	
BARLEY-IRRIGAT	IMPERIAL	1512	101.0	4.7	4.0	0.0		1512	
BARLEY-IRRIGAT	INYO	240	0.0	3.5	3.4	0.0		240	
BARLEY-IRRIGAT	KERN	33360	1.0	3.3	3.0	0.0		33360	
BARLEY-IRRIGAT	KINGS	50400	3.0	3.4	3.1	0.0		50400	
BARLEY-IRRIGAT	LASSEN	5040	0.0	4.4	4.0	0.0		5040	
BARLEY-IRRIGAT	LOS ANGELES	792	106.0	4.1	3.8	0.0		792	
BARLEY-IRRIGAT	MADERA	7320	34.0	4.2	3.7	0.0		7320	
BARLEY-IRRIGAT	MERCED	10560	9.0	3.1	2.9	0.0		10560	
BARLEY-IRRIGAT	MODOC	47040	0.0	4.4	4.0	0.0		47040	
BARLEY-IRRIGAT	MONTEREY	10560	0.0	2.7	2.4	0.0		10560	
BARLEY-IRRIGAT	RIVERSIDE	1008	405.0	5.0	4.4	0.0		1008	
BARLEY-IRRIGAT	SACRAMENTO	1200	0.0	3.2	2.9	0.0		1200	
BARLEY-IRRIGAT	SAN BENITO	1080	0.0	3.7	3.4	0.0		1080	
BARLEY-IRRIGAT	SAN BERNARDINO	960	610.5	5.1	4.4	0.0		960	
BARLEY-IRRIGAT	SAN DIEGO	504	64.0	5.2	4.3	0.0		504	
BARLEY-IRRIGAT	SAN JOAQUIN	5760	0.0	2.7	2.3	0.0		5760	
BARLEY-IRRIGAT	SAN LUIS OBISPO	1200	0.0	3.2	2.9	0.0		1200	
BARLEY-IRRIGAT	SAN MATEO	432	1.0	2.4	2.1	0.0		432	
BARLEY-IRRIGAT	SANTA BARBARA	600	0.0	2.7	2.3	0.0		600	
BARLEY-IRRIGAT	SHASTA	2256	0.0	4.3	4.0	0.0		2256	
BARLEY-IRRIGAT	SISKIYOU	81840	0.0	4.4	4.0	0.0		81840	
BARLEY-IRRIGAT	SOLANO	432	0.0	1.6	1.3	0.0		432	
BARLEY-IRRIGAT	SONOMA	96	0.0	2.3	1.9	0.0		96	
BARLEY-IRRIGAT	STANISLAUS	4104	9.0	3.1	2.9	0.0		4104	
BARLEY-IRRIGAT	SUTTER	5040	0.0	2.3	2.1	0.0		5040	
BARLEY-IRRIGAT	TEHAMA	1248	0.0	2.3	2.1	0.0		1248	
BARLEY-IRRIGAT	TULARE	33840	1.0	3.9	3.4	0.0		33840	
BARLEY-IRRIGAT	YOLO	216	0.0	3.2	2.9	0.0		216	
	STATEWIDE	422112						422112	
	STATEWIDE/POTENTIAL							1.000	
BEANS-DRY	BUTTE	3200	0.0	4.4	4.0	0.0	13.7	3200	3710
BEANS-DRY	COLUSA	7425	3.0	5.8	5.4	0.1	23.3	7430	9686
BEANS-DRY	FRESNO	11700	94.0	7.8	6.9	2.3	36.2	11970	18332
BEANS-DRY	GLENN	4206	0.0	5.5	5.0	0.0	21.2	4206	5338
BEANS-DRY	HUMBOLDT	13	0.0	3.0	2.6	0.0	3.6	13	13
BEANS-DRY	KERN	9580	112.0	8.0	7.1	2.7	36.9	9845	15189
BEANS-DRY	KINGS	1985	10.0	6.0	5.6	0.2	24.7	1990	2634
BEANS-DRY	MADERA	4324	121.5	7.8	7.1	2.9	36.1	4454	6763
BEANS-DRY	MERCED	9330	160.0	7.6	6.9	3.8	34.9	9703	14330
BEANS-DRY	MONO	173	0.0	4.8	4.9	0.0	16.7	173	208
BEANS-DRY	MONTEREY	4275	0.0	3.0	2.7	0.0	3.5	4275	4430
BEANS-DRY	ORANGE	603	3319.0	9.6	8.6	79.7	45.7	2964	1110
BEANS-DRY	RIVERSIDE	620	1047.0	9.6	7.9	25.1	45.6	828	1140
BEANS-DRY	SAN BERNARDINO	785	1006.0	10.6	8.4	24.1	50.8	1035	1596
BEANS-DRY	SAN JOAQUIN	21700	75.0	6.2	5.4	1.8	25.8	22098	29254
BEANS-DRY	SAN LUIS OBISPO	220	1.0	4.4	4.0	0.0	14.0	220	256
BEANS-DRY	SAN MATEO	14	3.0	3.1	2.7	0.1	4.6	14	15
BEANS-DRY	SANTA BARBARA	4295	0.0	3.8	3.3	0.0	9.4	4295	4743
BEANS-DRY	SOLANO	5520	0.0	2.3	1.9	0.0	-1.6	5520	5520
BEANS-DRY	STANISLAUS	36400	131.0	6.3	5.8	3.1	26.9	37582	49804
BEANS-DRY	SUTTER	17138	5.0	5.8	5.4	0.1	23.8	17159	22491
BEANS-DRY	TEHAMA	720	0.0	4.6	4.3	0.0	15.5	720	852
BEANS-DRY	TULARE	11100	48.0	7.1	6.4	1.2	31.8	11229	16286
BEANS-DRY	YOLO	1768	24.0	5.6	4.9	0.6	22.1	1778	2269
BEANS-DRY	YUBA	641	5.0	5.8	5.4	0.1	23.8	642	809
	STATEWIDE	157735						163343	216778
	STATEWIDE/POTENTIAL							0.966	0.728

BROCCOLI	FRESNO	9920	137.5	5.5	4.9	0.0	9920
BROCCOLI	IMPERIAL	25519	4.0	4.0	3.3	0.0	25519
BROCCOLI	MONTEREY	281210	0.0	2.6	2.3	0.0	281210
BROCCOLI	RIVERSIDE	8095	4.0	4.0	3.3	0.0	8095
BROCCOLI	SAN BENITO	10155	0.0	4.0	3.5	0.0	10155
BROCCOLI	SAN LUIS OBISPO	21873	0.5	3.9	3.5	0.0	21873
BROCCOLI	SANTA BARBARA	107027	0.0	2.7	2.3	0.0	107027
BROCCOLI	SANTA CLARA	1540	0.0	4.0	3.5	0.0	1540
BROCCOLI	VENTURA	29636	33.0	4.3	3.7	0.0	29636
	STATEWIDE	494975					494975
	STATEWIDE/POTENTIAL						1.000
CANTALOUPES	FRESNO	267000	170.0	7.4	6.8	0.0	267000
CANTALOUPES	IMPERIAL	103948	284.0	5.8	5.1	0.0	103948
CANTALOUPES	KERN	20400	1.0	4.1	3.8	0.0	20400
CANTALOUPES	KINGS	10237	13.0	5.4	5.1	0.0	10237
CANTALOUPES	MERCED	67995	181.0	6.4	5.9	0.0	67995
CANTALOUPES	RIVERSIDE	61139	101.0	6.5	5.9	0.0	61139
CANTALOUPES	STANISLAUS	7960	181.0	6.4	5.9	0.0	7960
	STATEWIDE	538679					538679
	STATEWIDE/POTENTIAL						1.000
CARROTS	IMPERIAL	185322	4.0	4.0	3.3	0.0	185322
CARROTS	KERN	163000	185.5	4.8	4.3	0.0	163000
CARROTS	MONTEREY	129715	0.0	2.6	2.3	0.0	129715
CARROTS	RIVERSIDE	62804	4.0	4.0	3.3	0.0	62804
CARROTS	SAN BENITO	3780	0.0	4.0	3.5	0.0	3780
CARROTS	SAN LUIS OBISPO	35620	1.0	4.0	3.5	0.0	35620
	STATEWIDE	580241					580241
	STATEWIDE/POTENTIAL						1.000
CAULIFLOWER	FRESNO	19300	231.5	5.7	5.0	0.0	19300
CAULIFLOWER	IMPERIAL	8239	4.0	4.0	3.3	0.0	8239
CAULIFLOWER	MONTEREY	145355	0.0	2.6	2.3	0.0	145355
CAULIFLOWER	ORANGE	4549	108.0	4.8	4.1	0.0	4549
CAULIFLOWER	RIVERSIDE	2562	215.0	5.7	5.0	0.0	2562
CAULIFLOWER	SAN BENITO	4650	0.0	4.0	3.5	0.0	4650
CAULIFLOWER	SAN DIEGO	5880	15.0	4.6	4.0	0.0	5880
CAULIFLOWER	SAN LUIS OBISPO	7990	1.0	4.0	3.5	0.0	7990
CAULIFLOWER	SANTA BARBARA	46356	0.0	2.7	2.3	0.0	46356
CAULIFLOWER	SANTA CLARA	2250	0.0	4.0	3.5	0.0	2250
CAULIFLOWER	SANTA CRUZ	2247	0.0	3.4	3.0	0.0	2247
CAULIFLOWER	STANISLAUS	3070	65.0	5.3	4.8	0.0	3070
CAULIFLOWER	VENTURA	12490	33.0	4.3	3.7	0.0	12490
	STATEWIDE	264938					264938
	STATEWIDE/POTENTIAL						1.000
CELERY	MONTEREY	158675	0.0	2.8	2.4	0.0	158675
CELERY	ORANGE	32952	294.0	4.4	3.5	0.0	32952
CELERY	SAN DIEGO	12611	97.0	4.2	3.5	0.0	12611
CELERY	SAN LUIS OBISPO	34086	1.0	4.1	3.6	0.0	34086
CELERY	SANTA BARBARA	78697	0.0	2.8	2.4	0.0	78697
CELERY	SANTA CRUZ	6493	0.0	3.5	3.1	0.0	6493
CELERY	VENTURA	310323	19.0	4.1	3.5	0.0	310323
	STATEWIDE	633837					633837
	STATEWIDE/POTENTIAL						1.000
CHERRIES	CONTRA COSTA	837	23.0	5.7	5.0	0.0	837
CHERRIES	EL DORADO	57	45.0	5.4	5.2	0.0	57

CHERRIES	PLACER	22	52.5	5.0	4.7	0.0				22			
CHERRIES	RIVERSIDE	60	714.0	5.4	5.3	0.0				60			
CHERRIES	SAN BENITO	720	0.0	4.3	3.8	0.0				720			
CHERRIES	SAN JOAQUIN	33700	9.0	4.3	3.8	0.0				33700			
CHERRIES	SANTA CLARA	3240	9.0	4.6	3.9	0.0				3240			
CHERRIES	SOLANO	95	0.0	2.1	1.8	0.0				95			
CHERRIES	STANISLAUS	1650	126.5	5.4	5.0	0.0				1650			
	STATEWIDE	40381								40381			
	STATEWIDE/POTENTIAL									1.000			
CORN-FIELD	AMADOR	2524	45.0	5.9	5.6	2.3				2583			
CORN-FIELD	BUTTE	8200	0.0	3.8	3.6	0.4				8232			
CORN-FIELD	COLUSA	42900	3.0	5.6	5.2	1.9				43715			
CORN-FIELD	CONTRA COSTA	25600	24.0	5.3	4.7	1.5				25990			
CORN-FIELD	FRESNO	37000	197.5	7.4	6.7	5.6				39175			
CORN-FIELD	GLENN	29640	0.0	5.3	4.9	1.5				30102			
CORN-FIELD	IMPERIAL	2073	369.0	6.6	6.1	3.6				2150			
CORN-FIELD	KERN	26300	113.0	6.0	5.4	2.6				26991			
CORN-FIELD	KINGS	57989	14.0	5.4	5.1	1.6				58956			
CORN-FIELD	LASSEN	529	0.0	4.4	4.0	0.7				533			
CORN-FIELD	MADERA	43120	162.5	6.8	6.3	4.0				44907			
CORN-FIELD	MERCED	64100	194.0	6.4	5.9	3.3				66263			
CORN-FIELD	MONTEREY	2025	0.0	2.9	2.7	0.1				2027			
CORN-FIELD	RIVERSIDE	1400	1537.0	9.1	7.6	11.5				1581			
CORN-FIELD	SACRAMENTO	205000	111.0	5.1	4.7	1.3				207804			
CORN-FIELD	SAN JOAQUIN	349000	61.0	5.5	5.0	1.8				355349			
CORN-FIELD	SOLANO	186150	0.0	2.4	2.0	0.0				186150			
CORN-FIELD	STANISLAUS	26000	133.5	5.8	5.5	2.3				26599			
CORN-FIELD	SUTTER	30125	0.0	3.8	3.6	0.4				30241			
CORN-FIELD	TEHAMA	7000	0.0	3.8	3.6	0.4				7027			
CORN-FIELD	TULARE	45600	67.0	6.5	6.0	3.4				47204			
CORN-FIELD	YOLO	180000	23.0	5.1	4.6	1.4				182481			
CORN-FIELD	YUBA	2118	0.0	3.8	3.6	0.4				2126			
	STATEWIDE	1374393								1398186			
	STATEWIDE/POTENTIAL									0.983			
CORN-SWEET	CONTRA COSTA	6062	15.0	3.9	3.3	2.1				6195			
CORN-SWEET	HUMBOLDT	106	0.0	2.9	2.6	0.3				106			
CORN-SWEET	LOS ANGELES	4025	1038.0	6.3	5.3	8.0				4374			
CORN-SWEET	ORANGE	17595	108.0	5.2	4.5	5.7				18658			
CORN-SWEET	RIVERSIDE	20766	215.0	6.2	5.6	8.8				22781			
CORN-SWEET	SACRAMENTO	2305	0.0	4.1	3.7	3.5				2388			
CORN-SWEET	SAN BERNARDINO	525	697.0	7.8	6.7	12.1				597			
CORN-SWEET	SAN DIEGO	4831	19.0	4.7	4.2	5.0				5083			
CORN-SWEET	SAN JOAQUIN	1541	9.0	4.5	4.1	4.5				1614			
CORN-SWEET	SANTA CLARA	2750	9.0	4.6	3.9	4.0				2865			
CORN-SWEET	SOLANO	2795	0.0	2.5	2.1	-1.2				2795			
CORN-SWEET	SUTTER	1175	0.0	3.5	3.3	2.3				1203			
	STATEWIDE	64476								68659			
	STATEWIDE/POTENTIAL									0.939			
COTTON	FRESNO	230076	228.0	7.8	6.9	30.2	21.0	23.2	44.0	329817	291175	299656	410599
COTTON	IMPERIAL	20440	369.0	6.0	5.5	15.9	15.1	15.6	24.5	24298	24079	24209	27074
COTTON	KERN	173040	183.0	6.9	6.1	22.7	18.2	19.5	33.8	223997	211553	214851	261357
COTTON	KINGS	132310	15.0	5.7	5.4	13.8	14.0	14.3	21.7	153574	153927	154362	169019
COTTON	MADERA	23866	198.5	7.2	6.6	25.1	19.1	20.7	37.0	31879	29516	30095	37890
COTTON	MERCED	35000	225.0	6.7	6.2	21.3	17.6	18.7	31.9	44498	42489	43055	51394
COTTON	RIVERSIDE	16818	369.0	6.0	5.5	15.9	15.1	15.6	24.5	19992	19812	19919	22276
COTTON	TULARE	95288	68.0	6.9	6.3	22.7	18.2	19.4	33.7	123215	116448	118247	143677
	STATEWIDE	726838								951270	888999	904394	1123286

	STATEWIDE/POTENTIAL						0.764	0.818	0.804	0.647
FIGS	FRESNO	4560	230.5	7.2	6.4	0.0	4560			
FIGS	MADERA	2595	199.0	6.4	5.8	0.0	2595			
FIGS	MERCED	3480	225.0	5.9	5.4	0.0	3480		8	
	STATEWIDE	10635					10635			
	STATEWIDE/POTENTIAL						1.000			
GARLIC	FRESNO	61600	171.0	5.3	4.8	0.0	61600			
GARLIC	KERN	16290	28.0	4.0	3.6	0.0	16290			
GARLIC	MONTEREY	7070	0.0	2.6	2.3	0.0	7070			
GARLIC	SAN BENITO	1160	0.0	3.8	3.4	0.0	1160			
GARLIC	SANTA CLARA	800	0.0	3.8	3.4	0.0	800			
	STATEWIDE	86920					86920			
	STATEWIDE/POTENTIAL						1.000			
GRAIN HAY	ALAMEDA	13965	9.0	2.9	2.3	0.0	13965			
GRAIN HAY	AMADOR	2775	8.0	4.4	4.2	0.0	2775			
GRAIN HAY	BUTTE	7200	0.0	2.3	2.1	0.0	7200			
GRAIN HAY	CALAVERAS	500	194.0	6.4	5.9	0.0	500			
GRAIN HAY	COLUSA	8400	0.0	2.3	2.1	0.0	8400			
GRAIN HAY	CONTRA COSTA	2120	2.0	2.4	1.9	0.0	2120			
GRAIN HAY	DEL NORTE	345	0.0	2.9	2.6	0.0	345			
GRAIN HAY	EL DORADO	2500	45.0	5.9	5.6	0.0	2500			
GRAIN HAY	HUMBOLDT	238	0.0	2.9	2.6	0.0	238			
GRAIN HAY	KERN	38600	1.0	3.3	3.0	0.0	38600			
GRAIN HAY	KINGS	2260	3.0	3.4	3.1	0.0	2260			
GRAIN HAY	LASSEN	19800	0.0	3.7	3.6	0.0	19800			
GRAIN HAY	LOS ANGELES	2544	106.0	4.1	3.8	0.0	2544			
GRAIN HAY	MADERA	4500	34.0	4.2	3.7	0.0	4500			
GRAIN HAY	MERCED	60500	9.0	3.1	2.9	0.0	60500			
GRAIN HAY	MODOC	20400	0.0	4.4	4.0	0.0	20400			
GRAIN HAY	MONTEREY	6750	0.0	2.7	2.4	0.0	6750			
GRAIN HAY	NAPA	12850	0.0	2.4	2.0	0.0	12850			
GRAIN HAY	ORANGE	1106	84.0	4.3	3.6	0.0	1106			
GRAIN HAY	PLACER	3000	54.0	5.5	5.2	0.0	3000			
GRAIN HAY	PLUMAS	2600	0.0	3.8	3.6	0.0	2600			
GRAIN HAY	RIVERSIDE	5642	101.0	4.7	4.0	0.0	5642			
GRAIN HAY	SACRAMENTO	21400	0.0	3.2	2.9	0.0	21400			
GRAIN HAY	SAN BENITO	28600	0.0	3.7	3.4	0.0	28600			
GRAIN HAY	SAN BERNARDINO	19200	335.3	4.7	4.2	0.0	19200			
GRAIN HAY	SAN DIEGO	1889	64.0	5.2	4.3	0.0	1889			
GRAIN HAY	SAN LUIS OBISPO	57000	0.0	3.2	2.9	0.0	57000			
GRAIN HAY	SAN MATEO	4200	1.0	2.4	2.1	0.0	4200			
GRAIN HAY	SANTA BARBARA	10999	0.0	2.7	2.3	0.0	10999			
GRAIN HAY	SANTA CLARA	33750	0.0	3.7	3.4	0.0	33750			
GRAIN HAY	SIERRA	1320	0.0	3.8	3.6	0.0	1320			
GRAIN HAY	SOLANO	13750	0.0	1.6	1.3	0.0	13750			
GRAIN HAY	SONOMA	41000	0.0	2.3	1.9	0.0	41000			
GRAIN HAY	STANISLAUS	42800	9.0	3.1	2.9	0.0	42800			
GRAIN HAY	SUTTER	12575	0.0	2.3	2.1	0.0	12575			
GRAIN HAY	TEHAMA	9600	0.0	2.3	2.1	0.0	9600			
GRAIN HAY	TRINITY	130	0.0	2.9	2.6	0.0	130			
GRAIN HAY	TULARE	7200	1.0	3.9	3.4	0.0	7200			
GRAIN HAY	TUOLUMNE	345	9.0	3.1	2.9	0.0	345			
GRAIN HAY	VENTURA	4000	19.0	4.3	3.7	0.0	4000			
GRAIN HAY	YOLO	23600	0.0	3.2	2.9	0.0	23600			
GRAIN HAY	YUBA	3377	0.0	2.3	2.1	0.0	3377			
	STATEWIDE	555330					555330			
	STATEWIDE/POTENTIAL						1.000			

GRAIN SORGHUM	BUTTE	4800	0.0	4.2	3.9	0.0		4800	
GRAIN SORGHUM	COLUSA	7040	3.0	5.6	5.2	0.0		7040	
GRAIN SORGHUM	FRESNO	4930	163.0	7.9	6.9	0.0		4930	
GRAIN SORGHUM	GLENN	5400	0.0	5.3	4.9	0.0		5400	
GRAIN SORGHUM	IMPERIAL	3883	215.0	7.2	6.7	0.0		3883	
GRAIN SORGHUM	KERN	10000	112.0	7.2	6.5	0.0		10000	
GRAIN SORGHUM	KINGS	4578	11.0	5.9	5.6	0.0		4578	
GRAIN SORGHUM	MADERA	1000	137.5	7.5	6.8	0.0		1000	
GRAIN SORGHUM	MERCED	2840	176.0	7.3	6.7	0.0		2840	
GRAIN SORGHUM	RIVERSIDE	2402	624.0	8.0	7.1	0.0		2402	
GRAIN SORGHUM	SACRAMENTO	4760	2.0	4.0	3.7	0.0		4760	
GRAIN SORGHUM	SAN JOAQUIN	3060	58.5	6.0	5.4	0.0		3060	
GRAIN SORGHUM	SOLANO	4500	0.0	2.4	2.0	0.0		4500	
GRAIN SORGHUM	SUTTER	23488	0.0	4.2	3.9	0.0		23488	
GRAIN SORGHUM	TEHAMA	1150	0.0	4.6	4.3	0.0		1150	
GRAIN SORGHUM	TULARE	13500	66.0	7.2	6.6	0.0		13500	
GRAIN SORGHUM	YOLO	8360	23.0	5.6	5.0	0.0		8360	
	STATEWIDE	105691						105691	
	STATEWIDE/POTENTIAL							1.000	
GRAPEFRUIT	IMPERIAL	4895	371.0	6.0	5.5	0.0		4895	
GRAPEFRUIT	KERN	9080	185.5	6.1	5.4	0.0		9080	
GRAPEFRUIT	ORANGE	1012	432.0	5.9	4.9	0.0		1012	
GRAPEFRUIT	RIVERSIDE	201158	371.0	6.0	5.5	0.0		201158	
GRAPEFRUIT	SAN BERNARDINO	15510	3439.0	9.1	8.1	0.0		15510	
GRAPEFRUIT	SAN DIEGO	33713	219.0	6.4	5.6	0.0		33713	
GRAPEFRUIT	TULARE	1330	68.0	6.2	5.6	0.0		1330	
GRAPEFRUIT	VENTURA	5983	53.3	5.6	4.9	0.0		5983	
	STATEWIDE	272681						272681	
	STATEWIDE/POTENTIAL							1.000	
GRAPES-RAISIN	FRESNO	1326140	230.5	7.2	6.4	34.4	26.0	2020293	1793039
GRAPES-RAISIN	KERN	179540	185.5	6.1	5.4	25.8	19.6	242082	223252
GRAPES-RAISIN	KINGS	17010	15.0	5.3	5.0	21.7	16.4	21726	20359
GRAPES-RAISIN	MADERA	363936	199.0	6.4	5.8	29.4	22.3	515768	468447
GRAPES-RAISIN	MERCED	25715	225.0	5.9	5.4	25.7	19.5	34632	31949
GRAPES-RAISIN	STANISLAUS	20021	153.5	5.4	5.0	21.9	16.6	25629	24001
GRAPES-RAISIN	TULARE	284467	68.0	6.2	5.6	26.8	20.3	388626	356977
	STATEWIDE	2216829						3248756	2918024
	STATEWIDE/POTENTIAL							0.682	0.760
GRAPES-TABLE	FRESNO	48000	230.5	7.2	6.4	34.4	26.0	73125	64900
GRAPES-TABLE	KERN	79500	185.5	6.1	5.4	25.8	19.6	107194	98856
GRAPES-TABLE	KINGS	1318	15.0	5.3	5.0	21.7	16.4	1683	1577
GRAPES-TABLE	MADERA	2978	199.0	6.4	5.8	29.4	22.3	4220	3833
GRAPES-TABLE	RIVERSIDE	69461	215.0	7.2	6.7	36.6	27.8	109636	96168
GRAPES-TABLE	SAN JOAQUIN	133000	79.5	5.2	4.6	18.4	13.9	162922	154505
GRAPES-TABLE	TULARE	151600	68.0	6.2	5.6	26.8	20.3	207109	190242
	STATEWIDE	485857						665889	610081
	STATEWIDE/POTENTIAL							0.730	0.796
GRAPES-WINE	ALAMEDA	5286	90.0	4.5	3.6	9.8	7.4	5857	5708
GRAPES-WINE	AMADOR	4641	46.0	5.4	5.1	23.1	17.5	6036	5626
GRAPES-WINE	CALAVERAS	100	46.0	5.4	5.1	23.1	17.5	130	121
GRAPES-WINE	CONTRA COSTA	1566	31.0	3.9	3.2	6.2	4.7	1669	1643
GRAPES-WINE	EL DORADO	1377	46.0	5.4	5.1	23.1	17.5	1791	1669
GRAPES-WINE	FRESNO	298900	230.5	7.2	6.4	34.4	26.0	455356	404135
GRAPES-WINE	KERN	242160	185.5	6.1	5.4	25.8	19.6	326516	301118
GRAPES-WINE	KINGS	9774	15.0	5.3	5.0	21.7	16.4	12484	11698

GRAPES-WINE	LAKE	9901	0.0	3.7	3.5	8.6	6.5		10834	10592	
GRAPES-WINE	MADERA	247389	199.0	6.4	5.8	29.4	22.3		350598	318431	
GRAPES-WINE	MENDOCINO	38626	0.0	2.8	2.5	0.4	0.3		38796	38755	
GRAPES-WINE	MERCED	137000	225.0	5.9	5.4	25.7	19.5		184505	170214	
GRAPES-WINE	MONTEREY	117020	0.0	2.9	2.5	0.4	0.3		117433	117333	
GRAPES-WINE	NAPA	99996	3.0	3.7	3.1	5.0	3.8		105269	103942	
GRAPES-WINE	PLACER	265	59.5	5.2	4.8	20.3	15.4		332	313	
GRAPES-WINE	RIVERSIDE	10378	800.5	6.1	5.5	26.5	20.1		14127	12991	
GRAPES-WINE	SACRAMENTO	29400	2.0	3.7	3.4	7.8	5.9		31894	31252	
GRAPES-WINE	SAN BENITO	12000	0.0	4.6	4.0	13.5	10.3		13878	13371	
GRAPES-WINE	SAN BERNARDINO	13740	4373.0	9.9	8.5	52.5	39.8		28903	22808	
GRAPES-WINE	SAN DIEGO	315	164.0	5.6	4.8	20.7	15.7		397	373	
GRAPES-WINE	SAN JOAQUIN	242000	79.5	5.2	4.6	18.4	13.9		296445	281130	
GRAPES-WINE	SAN LUIS OBISPO	23551	5.5	3.5	3.1	5.6	4.3		24954	24599	
GRAPES-WINE	SANTA BARBARA	33380	0.0	3.7	3.2	6.5	4.9		35702	35110	
GRAPES-WINE	SANTA CLARA	3900	50.0	4.5	3.8	11.2	8.5		4390	4260	
GRAPES-WINE	SANTA CRUZ	160	0.0	3.6	3.1	5.5	4.2		169	167	
GRAPES-WINE	SOLANO	5632	0.0	2.2	1.8	-6.1	-4.6		5632	5632	
GRAPES-WINE	SONOMA	100293	1.0	3.4	2.9	3.8	2.9		104232	103250	
GRAPES-WINE	STANISLAUS	119600	153.5	5.4	5.0	21.9	16.6		153099	143376	
GRAPES-WINE	TULARE	118000	68.0	6.2	5.6	26.8	20.3		161206	148078	
GRAPES-WINE	YOLO	6521	24.0	4.9	4.4	16.4	12.5		7803	7449	
	STATEWIDE	1932871							2500437	2325144	
	STATEWIDE/POTENTIAL								0.773	0.831	
HONEYDEW	FRESNO	10900	170.0	7.4	6.8	0.0			10900		
HONEYDEW	IMPERIAL	16721	302.0	6.8	6.3	0.0			16721		
HONEYDEW	RIVERSIDE	8357	213.0	7.8	7.3	0.0			8357		
HONEYDEW	STANISLAUS	20900	126.5	5.9	5.6	0.0			20900		
HONEYDEW	SUTTER	19765	0.0	3.8	3.6	0.0			19765		
HONEYDEW	YOLO	33910	17.0	5.0	4.6	0.0			33910		
	STATEWIDE	110553							110553		
	STATEWIDE/POTENTIAL			1984 DOSES		1983 12 HR	1984 LOSS		1.000		
LEMONS	FRESNO	11930	230.5	7.2	6.4	5.6	26.3		16187		
LEMONS	IMPERIAL	9544	371.0	6.0	5.5	4.4	16.1		11375		
LEMONS	KERN	15900	185.5	6.1	5.4	5.4	24.7		21116		
LEMONS	LOS ANGELES	1507	1177.0	7.1	5.5	5.7	27.1		2067		
LEMONS	ORANGE	15103	432.0	5.9	4.9	5.0	21.2		19166		
LEMONS	RIVERSIDE	104351	1330.3	7.4	6.5	7.6	42.9		182751		
LEMONS	SAN BERNARDINO	15029	3373.0	8.9	7.4	7.8	45.2		27385		
LEMONS	SAN DIEGO	54030	164.0	5.6	4.8	5.8	28.2		75251		
LEMONS	SAN LUIS OBISPO	14359	0.0	3.9	3.7	4.0	12.6		16429		
LEMONS	SANTA BARBARA	28492	45.0	4.9	4.3	4.6	17.4		34494		
LEMONS	TULARE	50800	68.0	6.2	5.6	5.6	26.3		68928		
LEMONS	VENTURA	280767	53.3	5.6	4.9	5.2	23.0		364633		
	STATEWIDE	601812							839782		
	STATEWIDE/POTENTIAL								0.717		
LETTUCE	FRESNO	245900	63.5	4.8	4.2	0.0	3.3	0.0	245900	254280	245968
LETTUCE	IMPERIAL	407614	2.0	3.7	3.0	0.0	0.1	0.0	407614	408038	407625
LETTUCE	KERN	93390	157.5	4.5	3.9	0.0	8.2	0.0	93390	101704	93403
LETTUCE	KINGS	11786	2.0	3.7	3.4	0.0	0.1	0.0	11786	11798	11786
LETTUCE	MONTEREY	1154207	0.0	2.8	2.5	0.0	0.0	0.0	1154207	1154207	1154209
LETTUCE	ORANGE	7836	106.0	4.0	3.3	0.0	5.5	0.0	7836	8292	7836
LETTUCE	RIVERSIDE	143811	2.0	3.4	2.7	0.0	0.1	0.0	143811	143960	143813
LETTUCE	SACRAMENTO	300	0.0	2.8	2.5	0.0	0.0	0.0	300	300	300
LETTUCE	SAN BENITO	17500	0.0	4.2	3.7	0.0	0.0	0.0	17500	17500	17501
LETTUCE	SAN BERNARDINO	1990	602.0	4.8	3.8	0.0	31.2	0.0	1990	2894	1991
LETTUCE	SAN LUIS OBISPO	156572	0.0	3.7	3.4	0.0	0.0	0.0	156572	156572	156576

LETTUCE	SAN MATEO	1264	3.0	2.8	2.3	0.0	0.2	0.0	1264	1266	1264
LETTUCE	SANTA BARBARA	135990	0.0	2.7	2.3	0.0	0.0	0.0	135990	135990	135990
LETTUCE	SANTA CLARA	6400	50.0	4.5	3.8	0.0	2.6	0.0	6400	6571	6401
LETTUCE	SANTA CRUZ	68770	0.0	3.4	3.0	0.0	0.0	0.0	68770	68770	68771
LETTUCE	VENTURA	90508	33.0	4.2	3.5	0.0	1.7	0.0	90508	92085	90515
	STATEWIDE	2543838							2543838	2564227	2543949
	STATEWIDE/POTENTIAL								1.000	0.992	1.000
LIMAS-GREEN(PR	MERCED	7880	176.0	7.3	6.7	0.0			7880		
LIMAS-GREEN(PR	SAN JOAQUIN	1700	58.5	6.0	5.4	0.0			1700		
LIMAS-GREEN(PR	STANISLAUS	18200	120.0	6.4	6.0	0.0			18200		
LIMAS-GREEN(PR	VENTURA	17114	0.0	4.6	4.1	0.0			17114		
	STATEWIDE	44894							44894		
	STATEWIDE/POTENTIAL								1.000		
NECTARINES	CONTRA COSTA	85	1.0	5.4	4.8	0.0			85		
NECTARINES	FRESNO	112000	159.0	7.8	7.1	0.0			112000		
NECTARINES	KERN	8190	1.0	4.6	4.3	0.0			8190		
NECTARINES	KINGS	9342	4.0	4.9	4.7	0.0			9342		
NECTARINES	MADERA	3260	41.0	6.1	5.7	0.0			3260		
NECTARINES	MERCED	1710	34.0	5.8	5.4	0.0			1710		
NECTARINES	RIVERSIDE	141	215.0	7.2	6.7	0.0			141		
NECTARINES	STANISLAUS	1410	22.5	5.4	5.1	0.0			1410		
NECTARINES	TULARE	73500	20.0	5.9	5.5	0.0			73500		
	STATEWIDE	209638							209638		
	STATEWIDE/POTENTIAL								1.000		
OATS	BUTTE	880	0.0	2.2	2.0	0.0			880		
OATS	LASSEN	720	0.0	4.4	4.0	0.0			720		
OATS	MADERA	700	34.0	3.7	3.3	0.0			700		
OATS	MERCED	740	9.0	2.8	2.6	0.0			740		
OATS	MODOC	1680	0.0	4.4	4.0	0.0			1680		
OATS	PLACER	700	4.5	3.5	3.2	0.0			700		
OATS	RIVERSIDE	659	317.0	4.5	4.0	0.0			659		
OATS	SACRAMENTO	900	0.0	3.0	2.7	0.0			900		
OATS	SAN JOAQUIN	3400	0.0	2.6	2.1	0.0			3400		
OATS	SAN MATEO	1400	1.0	2.3	2.0	0.0			1400		
OATS	SANTA BARBARA	152	0.0	3.0	2.7	0.0			152		
OATS	SHASTA	800	0.0	4.3	4.0	0.0			800		
OATS	SISKIYOU	14875	0.0	4.4	4.0	0.0			14875		
OATS	SOLANO	1980	0.0	1.6	1.3	0.0			1980		
OATS	SONOMA	2800	0.0	2.1	1.8	0.0			2800		
OATS	STANISLAUS	1170	9.0	2.8	2.6	0.0			1170		
OATS	SUTTER	1973	0.0	2.2	2.0	0.0			1973		
OATS	TEHAMA	800	0.0	2.7	2.5	0.0			800		
	STATEWIDE	36329							36329		
	STATEWIDE/POTENTIAL								1.000		
OLIVES	BUTTE	5770	0.0	3.8	3.5	0.0			5770		
OLIVES	CALAVERAS	90	46.0	5.7	5.5	0.0			90		
OLIVES	FRESNO	4280	230.0	7.5	6.7	0.0			4280		
OLIVES	GLENN	7628	0.0	5.1	4.7	0.0			7628		
OLIVES	KERN	15400	183.0	6.3	5.7	0.0			15400		
OLIVES	KINGS	4653	15.0	5.5	5.1	0.0			4653		
OLIVES	MADERA	9444	199.0	6.8	6.2	0.0			9444		
OLIVES	MERCED	130	225.0	6.3	5.8	0.0			130		
OLIVES	TEHAMA	9850	0.0	4.2	3.9	0.0			9850		
OLIVES	TULARE	28900	68.0	6.5	5.9	0.0			28900		
	STATEWIDE	86145							86145		
	STATEWIDE/POTENTIAL								1.000		

ONIONS-DRY(DEH	FRESNO	189000	198.5	5.8	5.2	26.9			258665	
ONIONS-DRY(DEH	IMPERIAL	75098	215.0	5.1	4.5	19.4			93182	
ONIONS-DRY(DEH	KERN	104000	113.0	4.7	4.3	17.5			126100	
ONIONS-DRY(DEH	KINGS	16848	14.0	4.2	3.9	13.9			19559	
ONIONS-DRY(DEH	MODOC	6380	0.0	3.8	3.4	9.1			7019	
ONIONS-DRY(DEH	MONTEREY	6030	0.0	3.0	2.7	1.6			6127	
ONIONS-DRY(DEH	RIVERSIDE	23895	215.0	5.1	4.5	19.4			29649	
ONIONS-DRY(DEH	SISKIYOU	3212	0.0	3.8	3.4	9.1			3534	
	STATEWIDE	424463							543835	
	STATEWIDE/POTENTIAL								0.780	
ONIONS-DRY(FRE	CONTRA COSTA	905	24.0	4.4	4.0	14.4			1057	
ONIONS-DRY(FRE	FRESNO	20900	198.5	5.8	5.2	26.9			28604	
ONIONS-DRY(FRE	IMPERIAL	40204	215.0	5.1	4.5	19.4			49885	
ONIONS-DRY(FRE	KERN	87400	113.0	4.7	4.3	17.5			105973	
ONIONS-DRY(FRE	LOS ANGELES	31017	2280.0	8.6	7.0	44.5			55845	
ONIONS-DRY(FRE	MONTEREY	5400	0.0	2.8	2.4	-0.6			5400	
ONIONS-DRY(FRE	RIVERSIDE	16041	215.0	5.1	4.5	19.4			19904	
ONIONS-DRY(FRE	SAN BENITO	15360	0.0	4.7	4.2	16.7			18447	
ONIONS-DRY(FRE	SAN BERNARDINO	540	0.0	1.6	1.1	-13.8			540	
ONIONS-DRY(FRE	SAN JOAQUIN	35400	12.0	3.8	3.3	7.5			38281	
ONIONS-DRY(FRE	SANTA CLARA	4875	50.0	4.8	4.0	15.2			5752	
	STATEWIDE	258042							329688	
	STATEWIDE/POTENTIAL								0.783	
ONIONS-DRY(TOT	CONTRA COSTA	905	24.0	5.3	4.7	21.4			1151	
ONIONS-DRY(TOT	FRESNO	209900	198.5	6.3	5.7	31.6			306810	
ONIONS-DRY(TOT	IMPERIAL	115302	215.0	5.7	5.0	24.7			153032	
ONIONS-DRY(TOT	KERN	191400	113.0	5.1	4.6	20.4			240444	
ONIONS-DRY(TOT	KINGS	16848	14.0	4.4	4.2	16.3			20138	
ONIONS-DRY(TOT	LOS ANGELES	31017	632.0	5.8	5.6	30.5			44627	
ONIONS-DRY(TOT	MODOC	6380	0.0	3.8	3.4	9.1			7019	
ONIONS-DRY(TOT	MONTEREY	11430	0.0	3.0	2.7	1.6			11614	
ONIONS-DRY(TOT	RIVERSIDE	39936	215.0	5.7	5.0	24.7			53004	
ONIONS-DRY(TOT	SAN BENITO	15360	0.0	4.1	3.6	11.3			17314	
ONIONS-DRY(TOT	SAN BERNARDINO	540	247.0	5.3	5.1	25.8			728	
ONIONS-DRY(TOT	SAN JOAQUIN	35400	12.0	4.2	3.6	10.8			39683	
ONIONS-DRY(TOT	SANTA CLARA	4875	50.0	4.8	4.0	15.2			5752	
ONIONS-DRY(TOT	SISKIYOU	3212	0.0	3.8	3.4	9.1			3534	
	STATEWIDE	682505				1983	1984	LOSS	904850	
	STATEWIDE/POTENTIAL		1984 DOSES			12 HR	OLSZYK	THOMPSON	0.754	
ORANGES	BUTTE	2086	0.0	3.6	3.4	2.9	2.5	6.1	2137	2229
ORANGES	FRESNO	217265	230.5	7.2	6.4	5.6	18.1	44.6	265282	392534
ORANGES	GLENN	7094	0.0	4.8	4.3	4.2	10.2	25.2	7891	9471
ORANGES	IMPERIAL	5024	371.0	6.0	5.5	4.4	11.3	27.9	5658	6959
ORANGES	KERN	178500	185.5	6.1	5.4	5.4	17.2	42.4	214480	309280
ORANGES	MADERA	31215	199.0	6.4	5.8	5.2	16.1	39.9	37211	51869
ORANGES	ORANGE	60339	432.0	5.9	4.9	5.0	14.8	36.6	70820	96531
ORANGES	RIVERSIDE	168857	1823.3	7.9	6.9	7.0	26.7	65.9	230364	494605
ORANGES	SAN BERNARDINO	57563	3439.0	9.1	8.1	7.6	30.3	75.0	82233	227178
ORANGES	SAN DIEGO	101201	164.0	5.6	4.8	5.8	19.7	48.7	125716	193912
ORANGES	TULARE	856100	68.0	6.2	5.6	5.6	18.4	45.5	1049142	1559233
ORANGES	VENTURA	108057	53.3	5.6	4.9	5.2	16.1	39.7	128639	132857
	STATEWIDE	1793301							2221106	3475758
	STATEWIDE/POTENTIAL								0.807	0.516
PASTURE-IRR	ALAMEDA	0	90.0	3.6	2.9	0.0			0	
PASTURE-IRR	AMADOR	0	46.0	5.9	5.7	0.0			0	

PASTURE-IRR	BUTTE	0	0.0	3.5	3.2	0.0	0
PASTURE-IRR	CALAVERAS	0	225.0	6.7	6.2	0.0	0
PASTURE-IRR	COLUSA	0	0.0	3.5	3.2	0.0	0
PASTURE-IRR	CONTRA COSTA	0	31.0	3.8	3.1	0.0	0
PASTURE-IRR	DEL NORTE	0	0.0	4.1	3.7	0.0	0
PASTURE-IRR	EL DORADO	0	46.0	5.9	5.7	0.0	0
PASTURE-IRR	FRESNO	0	231.0	6.8	6.1	0.0	0
PASTURE-IRR	GLENN	0	0.0	3.5	3.2	0.0	0
PASTURE-IRR	HUMBOLDT	0	0.0	3.0	2.7	0.0	0
PASTURE-IRR	IMPERIAL	0	371.0	5.1	4.5	0.0	0
PASTURE-IRR	INYO	0	0.0	4.8	4.8	0.0	0
PASTURE-IRR	KERN	0	183.0	5.7	5.1	0.0	0
PASTURE-IRR	KINGS	0	15.0	4.9	4.6	0.0	0
PASTURE-IRR	LAKE	0	0.0	3.6	3.4	0.0	0
PASTURE-IRR	LASSEN	0	0.0	4.1	3.8	0.0	0
PASTURE-IRR	MADERA	0	200.0	6.4	5.8	0.0	0
PASTURE-IRR	MARIN	0	2.0	3.4	3.0	0.0	0
PASTURE-IRR	MARIPOSA	0	225.0	6.7	6.2	0.0	0
PASTURE-IRR	MENDOCINO	0	0.0	2.6	2.4	0.0	0
PASTURE-IRR	MERCED	0	225.0	6.2	5.7	0.0	0
PASTURE-IRR	MODOC	0	0.0	4.1	3.8	0.0	0
PASTURE-IRR	MONO	0	0.0	4.7	4.8	0.0	0
PASTURE-IRR	MONTEREY	0	0.0	3.0	2.6	0.0	0
PASTURE-IRR	NAPA	0	3.0	3.5	2.9	0.0	0
PASTURE-IRR	NEVADA	0	46.0	5.9	5.7	0.0	0
PASTURE-IRR	ORANGE	0	386.0	5.6	4.7	0.0	0
PASTURE-IRR	PLACER	0	59.5	5.7	5.3	0.0	0
PASTURE-IRR	PLUMAS	0	0.0	4.0	3.7	0.0	0
PASTURE-IRR	RIVERSIDE	0	1465.0	7.0	6.4	0.0	0
PASTURE-IRR	SACRAMENTO	0	147.5	5.0	4.5	0.0	0
PASTURE-IRR	SAN BENITO	0	0.0	4.4	3.9	0.0	0
PASTURE-IRR	SAN BERNARDINO	0	680.0	6.6	6.1	0.0	0
PASTURE-IRR	SAN DIEGO	0	93.0	4.7	4.1	0.0	0
PASTURE-IRR	SAN JOAQUIN	0	19.0	4.6	4.0	0.0	0
PASTURE-IRR	SAN LUIS OBISPO	0	1.0	4.3	3.9	0.0	0
PASTURE-IRR	SAN MATEO	0	3.0	3.0	2.6	0.0	0
PASTURE-IRR	SANTA BARBARA	0	0.0	3.0	2.6	0.0	0
PASTURE-IRR	SANTA CLARA	0	0.0	4.4	3.9	0.0	0
PASTURE-IRR	SHASTA	0	0.0	4.2	3.9	0.0	0
PASTURE-IRR	SIERRA	0	46.0	5.9	5.7	0.0	0
PASTURE-IRR	SISKIYOU	0	0.0	4.1	3.8	0.0	0
PASTURE-IRR	SOLANO	0	0.0	2.1	1.7	0.0	0
PASTURE-IRR	SONOMA	0	0.0	2.9	2.5	0.0	0
PASTURE-IRR	STANISLAUS	0	153.5	5.4	5.0	0.0	0
PASTURE-IRR	SUTTER	0	0.0	3.5	3.2	0.0	0
PASTURE-IRR	TEHAMA	0	0.0	4.0	3.7	0.0	0
PASTURE-IRR	TRINITY	0	0.0	3.0	2.7	0.0	0
PASTURE-IRR	TULARE	0	68.0	5.9	5.3	0.0	0
PASTURE-IRR	TUOLUMNE	0	225.0	6.7	6.2	0.0	0
PASTURE-IRR	YOLO	0	24.0	4.7	4.2	0.0	0
PASTURE-IRR	YUBA	0	0.0	3.5	3.2	0.0	0
	STATEWIDE	0					0
	STATEWIDE/POTENTIAL						-1.000
PEACHES	BUTTE	35208	0.0	4.0	3.7	0.0	35208
PEACHES	CONTRA COSTA	767	31.0	4.3	3.6	0.0	767
PEACHES	EL DORADO	29	46.0	5.9	5.7	0.0	29
PEACHES	FRESNO	115100	228.0	7.8	6.9	0.0	115100
PEACHES	KERN	16240	183.0	6.9	6.1	0.0	16240
PEACHES	KINGS	38813	15.0	5.7	5.4	0.0	38813

PEACHES	LOS ANGELES	3300	665.0	7.6	7.4	0.0	3300
PEACHES	MADERA	10626	198.5	7.2	6.6	0.0	10626
PEACHES	MERCED	90300	225.0	6.7	6.2	0.0	90300
PEACHES	PLACER	314	59.5	5.7	5.3	0.0	314
PEACHES	RIVERSIDE	724	1043.0	6.0	6.1	0.0	724
PEACHES	SAN JOAQUIN	56400	79.5	5.8	5.2	0.0	56400
PEACHES	SOLANO	1580	0.0	2.4	2.0	0.0	1580
PEACHES	STANISLAUS	187700	153.5	6.1	5.7	0.0	187700
PEACHES	SUTTER	118393	5.0	4.9	4.5	0.0	118393
PEACHES	TEHAMA	405	0.0	4.4	4.1	0.0	405
PEACHES	TULARE	72900	68.0	6.9	6.3	0.0	72900
PEACHES	YOLO	1035	24.0	5.3	4.8	0.0	1035
PEACHES	YUBA	69049	0.0	4.0	3.7	0.0	69049
	STATEWIDE	818883					818883
	STATEWIDE/POTENTIAL						1.000
PEARS	CONTRA COSTA	2480	23.0	5.7	5.0	0.0	2480
PEARS	EL DORADO	4590	45.0	6.5	6.2	0.0	4590
PEARS	FRESNO	1030	168.0	7.8	7.2	0.0	1030
PEARS	LAKE	69196	0.0	4.2	4.1	0.0	69196
PEARS	LOS ANGELES	1320	406.0	7.6	7.5	0.0	1320
PEARS	MENDOCINO	49212	0.0	3.1	2.8	0.0	49212
PEARS	PLACER	817	52.5	6.1	5.7	0.0	817
PEARS	SACRAMENTO	116000	2.0	3.9	3.6	0.0	116000
PEARS	SAN BENITO	2429	0.0	4.8	4.3	0.0	2429
PEARS	SAN JOAQUIN	10300	57.0	5.8	5.3	0.0	10300
PEARS	SANTA CLARA	3420	9.0	4.8	4.0	0.0	3420
PEARS	SOLANO	15544	0.0	2.8	2.3	0.0	15544
PEARS	SONOMA	731	1.0	3.6	3.2	0.0	731
PEARS	STANISLAUS	2080	126.5	6.4	6.1	0.0	2080
PEARS	SUTTER	8106	4.0	4.8	4.4	0.0	8106
PEARS	TULARE	630	49.0	6.9	6.4	0.0	630
PEARS	YOLO	6786	17.0	5.3	4.9	0.0	6786
PEARS	YUBA	21474	4.0	4.8	4.4	0.0	21474
	STATEWIDE	316145					316145
	STATEWIDE/POTENTIAL						1.000
PISTACHIOS	FRESNO	343	197.5	7.4	6.7	0.0	343
PISTACHIOS	KERN	19400	113.0	6.0	5.4	0.0	19400
PISTACHIOS	KINGS	3075	14.0	5.4	5.1	0.0	3075
PISTACHIOS	MADERA	8571	162.5	6.8	6.3	0.0	8571
PISTACHIOS	MERCED	821	194.0	6.4	5.9	0.0	821
PISTACHIOS	TULARE	800	67.0	6.5	6.0	0.0	800
	STATEWIDE	33010					33010
	STATEWIDE/POTENTIAL						1.000
PLUMS	EL DORADO	517	15.0	5.7	5.4	0.0	517
PLUMS	FRESNO	111000	103.5	7.1	6.6	0.0	111000
PLUMS	KERN	14600	1.0	4.6	4.3	0.0	14600
PLUMS	KINGS	8470	4.0	4.9	4.7	0.0	8470
PLUMS	MADERA	2482	41.0	6.1	5.7	0.0	2482
PLUMS	MERCED	519	34.0	5.8	5.4	0.0	519
PLUMS	PLACER	2650	12.0	5.2	4.9	0.0	2650
PLUMS	RIVERSIDE	74	346.0	5.9	5.9	0.0	74
PLUMS	SOLANO	44	0.0	2.4	2.0	0.0	44
PLUMS	SUTTER	300	0.0	3.4	3.3	0.0	300
PLUMS	TULARE	118000	20.0	5.9	5.5	0.0	118000
	STATEWIDE	258656					258656
	STATEWIDE/POTENTIAL						1.000

POTATOES	HUMBOLDT	7041	0.0	3.0	2.7	4.7	0.0	7389	7041
POTATOES	INYO	805	0.0	4.9	4.8	57.9	0.0	1913	805
POTATOES	KERN	583970	28.0	4.5	4.1	38.4	0.3	947540	585659
POTATOES	MODOC	132000	0.0	3.2	3.0	13.6	0.0	152805	132000
POTATOES	MONO	1320	0.0	4.8	4.9	60.4	0.0	3333	1320
POTATOES	MONTEREY	29080	0.0	2.8	2.4	-1.5	0.0	29080	29080
POTATOES	RIVERSIDE	96431	498.5	7.3	6.6	102.0	5.1	96431	101650
POTATOES	SAN DIEGO	13172	70.0	6.3	5.5	74.3	0.7	51182	13268
POTATOES	SAN JOAQUIN	19250	57.0	4.8	4.3	43.3	0.6	33963	19364
POTATOES	SISKIYOU	192500	0.0	4.1	3.8	31.2	0.0	279760	192500
	STATEWIDE	1075569						1603396	1082687
	STATEWIDE/POTENTIAL							0.671	0.993
PRUNES	AMADOR	156	45.0	5.9	5.6	0.0		156	
PRUNES	BUTTE	17100	0.0	3.8	3.6	0.0		17100	
PRUNES	COLUSA	7350	3.0	5.6	5.2	0.0		7350	
PRUNES	FRESNO	1720	197.5	7.4	6.7	0.0		1720	
PRUNES	GLENN	12605	0.0	3.8	3.6	0.0		12605	
PRUNES	LAKE	236	0.0	4.0	3.8	0.0		236	
PRUNES	MENDOCINO	334	0.0	2.9	2.6	0.0		334	
PRUNES	MERCED	3410	194.0	6.4	5.9	0.0		3410	
PRUNES	SAN BENITO	254	0.0	4.6	4.1	0.0		254	
PRUNES	SANTA CLARA	6650	24.0	4.6	3.9	0.0		6650	
PRUNES	SOLANO	3945	0.0	2.4	2.0	0.0		3945	
PRUNES	SONOMA	4386	1.0	3.4	3.0	0.0		4386	
PRUNES	SUTTER	47889	0.0	3.8	3.6	0.0		47889	
PRUNES	TEHAMA	15740	0.0	4.2	4.0	0.0		15740	
PRUNES	TULARE	9580	67.0	6.5	6.0	0.0		9580	
PRUNES	YOLO	5532	23.0	5.1	4.6	0.0		5532	
PRUNES	YUBA	26256	0.0	3.8	3.6	0.0		26256	
	STATEWIDE	163143						163143	
	STATEWIDE/POTENTIAL							1.000	
RICE	BUTTE	313280	0.0	4.0	3.7	6.7		335690	
RICE	COLUSA	436600	3.0	5.4	5.0	12.7		499885	
RICE	FRESNO	28500	228.0	7.8	6.9	21.9		36476	
RICE	GLENN	244215	0.0	5.1	4.7	11.6		276347	
RICE	KERN	2300	183.0	6.9	6.1	18.7		2828	
RICE	MERCED	43200	225.0	6.7	6.2	18.0		52702	
RICE	PLACER	52600	59.5	5.7	5.3	14.0		61166	
RICE	SACRAMENTO	58500	147.5	5.3	4.9	12.5		66885	
RICE	SAN JOAQUIN	18600	79.5	5.8	5.2	14.3		21700	
RICE	STANISLAUS	7530	153.5	6.1	5.7	15.7		8931	
RICE	SUTTER	355763	0.0	4.0	3.7	6.7		381212	
RICE	TEHAMA	9450	0.0	4.4	4.0	8.4		10313	
RICE	YOLO	110548	24.0	5.3	4.8	12.5		126334	
RICE	YUBA	105824	0.0	4.0	3.7	6.7		113394	
	STATEWIDE	1786910						1993863	
	STATEWIDE/POTENTIAL							0.896	
SAFFLOWER	COLUSA	5150	0.0	5.1	4.8	0.0		5150	
SAFFLOWER	FRESNO	11500	104.5	6.6	6.1	0.0		11500	
SAFFLOWER	GLENN	1149	0.0	4.9	4.7	0.0		1149	
SAFFLOWER	KINGS	20334	4.0	4.6	4.3	0.0		20334	
SAFFLOWER	MERCED	2950	34.0	5.6	5.3	0.0		2950	
SAFFLOWER	SACRAMENTO	5850	47.0	7.0	6.6	0.0		5850	
SAFFLOWER	SAN JOAQUIN	8300	4.5	5.2	4.7	0.0		8300	
SAFFLOWER	SAN LUIS OBISPO	333	0.0	4.3	4.0	0.0		333	
SAFFLOWER	SOLANO	6820	0.0	2.6	2.2	0.0		6820	
SAFFLOWER	SUTTER	7836	0.0	3.6	3.5	0.0		7836	

SAFFLOWER	YOLO	12650	0.0	5.0	4.6	0.0			12650		
	STATEWIDE	82872							82872		
	STATEWIDE/POTENTIAL								1.000		
SILAGE-CORN	FRESNO	235000	168.0	7.8	7.2	6.8			252020		
SILAGE-CORN	GLENN	81000	0.0	5.4	5.1	1.7			82380		
SILAGE-CORN	KINGS	209601	13.0	5.8	5.5	2.2			214397		
SILAGE-CORN	LASSEN	1800	0.0	4.6	4.3	0.9			1816		
SILAGE-CORN	MADERA	125000	144.0	7.3	6.7	5.1			131715		
SILAGE-CORN	MERCED	807000	181.0	7.0	6.5	4.5			845051		
SILAGE-CORN	MONTEREY	8400	0.0	2.9	2.6	0.1			8406		
SILAGE-CORN	RIVERSIDE	15238	2006.0	9.1	7.5	11.3			17186		
SILAGE-CORN	SACRAMENTO	187000	94.0	5.3	4.9	1.5			189893		
SILAGE-CORN	SAN BENITO	38000	0.0	4.8	4.3	1.0			38400		
SILAGE-CORN	SAN BERNARDINO	35000	2006.0	9.1	7.5	11.3			39474		
SILAGE-CORN	SAN DIEGO	2636	188.0	6.5	5.7	3.4			2728		
SILAGE-CORN	SAN JOAQUIN	527000	57.0	5.8	5.3	2.3			539222		
SILAGE-CORN	SANTA BARBARA	28474	0.0	3.8	3.4	0.4			28588		
SILAGE-CORN	SISKIYOU	19000	0.0	4.6	4.3	0.9			19165		
SILAGE-CORN	SONOMA	15600	1.0	3.6	3.2	0.3			15645		
SILAGE-CORN	STANISLAUS	1104000	126.5	6.4	6.1	3.2			1141022		
SILAGE-CORN	SUTTER	63414	0.0	4.0	3.8	0.5			63724		
SILAGE-CORN	YUBA	69500	0.0	4.0	3.8	0.5			69840		
	STATEWIDE	3572663							3700672		
	STATEWIDE/POTENTIAL								0.965		
SPINACH	MONTEREY	30770	0.0	2.6	2.2	0.0	0.4		30770	30900	
SPINACH	RIVERSIDE	520	101.0	4.4	3.7	4.0	11.3		542	586	
SPINACH	SANTA BARBARA	5560	0.0	2.6	2.2	0.0	0.8		5560	5604	
SPINACH	SANTA CLARA	400	0.0	3.7	3.3	0.0	6.9		400	430	
SPINACH	STANISLAUS	18900	0.0	2.1	1.8	0.0	-2.6		18900	18900	
SPINACH	VENTURA	29237	19.0	4.1	3.5	0.8	9.6		29461	32360	
	STATEWIDE	85387							85633	88780	
	STATEWIDE/POTENTIAL								0.997	0.962	
STRAWBERRIES	CONTRA COSTA	45	27.0	4.1	3.6	0.0			45		
STRAWBERRIES	FRESNO	2960	68.0	4.5	4.0	0.0			2960		
STRAWBERRIES	LOS ANGELES	8390	86.0	2.8	2.2	0.0			8390		
STRAWBERRIES	MONTEREY	95400	0.0	2.6	2.3	0.0			95400		
STRAWBERRIES	RIVERSIDE	93	626.0	5.3	4.5	0.0			93		
STRAWBERRIES	SAN BERNARDINO	5490	626.0	5.3	4.5	0.0			5490		
STRAWBERRIES	SAN DIEGO	20707	35.0	4.3	3.6	0.0			20707		
STRAWBERRIES	SAN LUIS OBISPO	5088	0.0	3.7	3.3	0.0			5088		
STRAWBERRIES	SANTA BARBARA	36665	0.0	2.6	2.2	0.0			36665		
STRAWBERRIES	SANTA CLARA	6720	50.0	4.1	3.5	0.0			6720		
STRAWBERRIES	SANTA CRUZ	59000	0.0	3.3	3.0	0.0			59000		
STRAWBERRIES	VENTURA	73490	19.0	4.1	3.5	0.0			73490		
	STATEWIDE	314048							314048		
	STATEWIDE/POTENTIAL								1.000		
SUGAR BEETS	BUTTE	82500	0.0	3.8	3.7	0.0	0.0	5.2	82500	82500	87050
SUGAR BEETS	COLUSA	142800	0.0	5.1	4.8	0.0	0.0	10.3	142800	142800	159154
SUGAR BEETS	CONTRA COSTA	31000	1.0	5.4	4.8	0.0	0.0	10.2	31000	31000	34533
SUGAR BEETS	FRESNO	468000	37.0	7.6	7.1	0.0	0.0	20.2	468000	468000	586770
SUGAR BEETS	GLENN	164927	0.0	4.9	4.7	0.0	0.0	9.7	164927	164927	182733
SUGAR BEETS	IMPERIAL	947597	2.0	5.9	5.2	0.0	0.0	12.1	947597	947597	1078481
SUGAR BEETS	KERN	284000	0.0	5.5	5.1	0.0	0.0	11.4	284000	284000	320480
SUGAR BEETS	KINGS	38539	1.0	5.7	5.4	0.0	0.0	12.9	38539	38539	44241
SUGAR BEETS	LOS ANGELES	5200	127.0	7.7	7.6	0.0	0.0	22.5	5200	5200	6706
SUGAR BEETS	MADERA	59589	16.0	6.9	6.4	0.0	0.0	17.5	59589	59589	72225

SUGAR BEETS	MERCED	380000	16.0	6.6	6.2	0.0	0.0	16.2	380000	380000	453280
SUGAR BEETS	MONTEREY	174710	0.0	2.8	2.5	0.0	0.0	0.2	174710	174710	175098
SUGAR BEETS	SACRAMENTO	88000	0.0	3.8	3.6	0.0	0.0	4.7	88000	88000	92335
SUGAR BEETS	SAN BENITO	33600	0.0	4.5	4.1	0.0	0.0	7.1	33600	33600	36163
SUGAR BEETS	SAN JOAQUIN	775000	2.0	5.5	5.1	0.0	0.0	11.4	775000	775000	874550
SUGAR BEETS	SAN LUIS OBISPO	18797	0.0	4.0	3.7	0.0	0.0	5.5	18797	18797	19889
SUGAR BEETS	SANTA BARBARA	23825	0.0	2.8	2.6	0.0	0.0	0.3	23825	23825	23899
SUGAR BEETS	SANTA CLARA	16150	0.0	4.5	3.9	0.0	0.0	6.4	16150	16150	17250
SUGAR BEETS	SOLANO	455648	0.0	2.2	1.9	0.0	0.0	-2.8	455648	455648	455648
SUGAR BEETS	STANISLAUS	81600	9.0	6.1	5.8	0.0	0.0	14.5	81600	81600	95470
SUGAR BEETS	SUTTER	106568	0.0	3.8	3.7	0.0	0.0	5.2	106568	106568	112445
SUGAR BEETS	TEHAMA	43000	0.0	4.1	3.9	0.0	0.0	6.2	43000	43000	45821
SUGAR BEETS	TULARE	58100	19.0	6.9	6.3	0.0	0.0	17.0	58100	58100	69969
SUGAR BEETS	VENTURA	5890	10.0	6.8	5.8	0.0	0.0	14.7	5890	5890	6909
SUGAR BEETS	YOLO	386694	0.0	5.1	4.8	0.0	0.0	10.0	386694	386694	429496
	STATEWIDE	4871734							4871734	4871734	5480595
	STATEWIDE/POTENTIAL								1.000	1.000	0.889
TOMATOES-FRESH	FRESNO	61600	228.0	7.8	6.9	5.3			65040		
TOMATOES-FRESH	HUMBOLDT	182	0.0	3.0	2.7	0.0			182		
TOMATOES-FRESH	IMPERIAL	11389	369.0	6.4	5.9	8.6			12455		
TOMATOES-FRESH	KINGS	5504	13.0	5.4	5.1	0.3			5521		
TOMATOES-FRESH	MERCED	50833	181.0	6.4	5.9	4.2			53061		
TOMATOES-FRESH	MONTEREY	52630	0.0	3.0	2.8	0.0			52630		
TOMATOES-FRESH	ORANGE	10923	178.0	5.6	4.8	4.1			11394		
TOMATOES-FRESH	RIVERSIDE	845	369.0	6.5	5.9	8.6			924		
TOMATOES-FRESH	SACRAMENTO	1640	2.0	3.8	3.5	0.0			1641		
TOMATOES-FRESH	SAN BERNARDINO	155	1848.0	9.5	7.8	42.9			271		
TOMATOES-FRESH	SAN DIEGO	89890	87.0	4.5	4.0	2.0			91742		
TOMATOES-FRESH	SAN JOAQUIN	48200	79.5	5.8	5.2	1.8			49106		
TOMATOES-FRESH	SANTA CLARA	2625	50.0	4.9	4.1	1.2			2656		
TOMATOES-FRESH	SANTA CRUZ	460	0.0	3.6	3.1	0.0			460		
TOMATOES-FRESH	STANISLAUS	10500	153.5	6.1	5.7	3.6			10888		
TOMATOES-FRESH	SUTTER	1266	5.0	4.9	4.5	0.1			1267		
TOMATOES-FRESH	TULARE	14800	49.0	6.4	5.9	1.1			14970		
TOMATOES-FRESH	VENTURA	5655	5.0	4.8	4.3	0.1			5662		
	STATEWIDE	369097							379870		
	STATEWIDE/POTENTIAL								0.972		
TOMATOES-PROCE	COLUSA	321600	3.0	5.4	5.0	0.1	2.3	6.8	321820	329249	345032
TOMATOES-PROCE	CONTRA COSTA	138600	31.0	4.3	3.6	0.7	0.9	-76.0	139587	139914	138600
TOMATOES-PROCE	FRESNO	2060000	228.0	7.8	6.9	5.2	9.4	29.3	2172959	2272974	2914034
TOMATOES-PROCE	IMPERIAL	122975	369.0	6.4	5.9	8.4	4.6	20.2	134272	128865	154068
TOMATOES-PROCE	KERN	140000	28.0	5.3	4.9	0.6	2.3	3.6	140900	143255	145258
TOMATOES-PROCE	KINGS	63140	15.0	5.7	5.4	0.3	3.0	13.8	63357	65079	73208
TOMATOES-PROCE	MERCED	178000	225.0	6.7	6.2	5.1	5.5	23.4	187625	188428	232370
TOMATOES-PROCE	MONTEREY	64500	0.0	2.9	2.6	0.0	0.1	1012.3	64500	64560	64500
TOMATOES-PROCE	ORANGE	26390	333.0	6.0	5.0	7.6	3.7	7.0	28558	27392	28377
TOMATOES-PROCE	RIVERSIDE	87151	369.0	6.4	5.9	8.4	4.6	20.2	95157	91325	109186
TOMATOES-PROCE	SACRAMENTO	140000	2.0	3.8	3.5	0.0	0.5	-80.7	140064	140759	140000
TOMATOES-PROCE	SAN BENITO	184800	0.0	4.8	4.2	0.0	1.5	-18.6	184800	187571	184800
TOMATOES-PROCE	SAN JOAQUIN	613000	79.5	5.8	5.2	1.8	3.1	9.8	624316	632495	679550
TOMATOES-PROCE	SANTA BARBARA	52407	0.0	4.8	4.2	0.0	1.5	-22.2	52407	53193	52407
TOMATOES-PROCE	SANTA CLARA	81000	50.0	4.9	4.1	1.1	1.6	-23.3	81934	82334	81000
TOMATOES-PROCE	SOLANO	413322	0.0	2.4	2.0	0.0	0.0	232.5	413322	413322	413322
TOMATOES-PROCE	STANISLAUS	347000	153.5	6.1	5.7	3.5	3.9	18.3	359585	360980	424538
TOMATOES-PROCE	SUTTER	518017	5.0	4.9	4.5	0.1	1.6	-8.2	518608	526551	518017
TOMATOES-PROCE	VENTURA	118836	5.0	4.8	4.3	0.1	1.5	-14.9	118972	120665	118836
TOMATOES-PROCE	YOLO	1319000	24.0	5.3	4.8	0.5	2.3	1.6	1326257	1349433	1340714
	STATEWIDE	6989738							7169000	7318344	8157817

	STATEWIDE/POTENTIAL								0.975	0.955	0.857
WALNUTS	ALAMEDA	221	90.0	4.8	3.9	0.0			221		
WALNUTS	AMADOR	375	46.0	5.7	5.5	0.0			375		
WALNUTS	BUTTE	20341	0.0	3.8	3.5	0.0			20341		
WALNUTS	CALAVERAS	210	46.0	5.7	5.5	0.0			210		
WALNUTS	COLUSA	6600	3.0	5.4	5.0	0.0			6600		
WALNUTS	CONTRA COSTA	1810	31.0	4.2	3.5	0.0			1810		
WALNUTS	EL DORADO	132	46.0	5.7	5.5	0.0			132		
WALNUTS	FRESNO	4440	230.0	7.5	6.7	0.0			4440		
WALNUTS	GLENN	5319	0.0	3.8	3.5	0.0			5319		
WALNUTS	KERN	1390	183.0	6.3	5.7	0.0			1390		
WALNUTS	KINGS	8326	15.0	5.5	5.1	0.0			8326		
WALNUTS	LAKE	5224	0.0	4.0	3.8	0.0			5224		
WALNUTS	MADERA	2181	199.0	6.8	6.2	0.0			2181		
WALNUTS	MENDOCINO	35	0.0	3.0	2.7	0.0			35		
WALNUTS	MERCED	10000	225.0	6.3	5.8	0.0			10000		
WALNUTS	MONTEREY	224	0.0	3.0	2.7	0.0			224		
WALNUTS	NAPA	209	3.0	3.9	3.3	0.0			209		
WALNUTS	PLACER	675	59.5	5.5	5.1	0.0			675		
WALNUTS	RIVERSIDE	5	1061.0	5.6	5.6	0.0			5		
WALNUTS	SACRAMENTO	310	147.5	5.3	4.8	0.0			310		
WALNUTS	SAN BENITO	5200	0.0	4.7	4.2	0.0			5200		
WALNUTS	SAN JOAQUIN	34100	79.5	5.6	5.0	0.0			34100		
WALNUTS	SAN LUIS OBISPO	1458	7.0	3.8	3.4	0.0			1458		
WALNUTS	SANTA BARBARA	768	0.0	4.8	4.2	0.0			768		
WALNUTS	SANTA CLARA	1385	50.0	4.8	4.0	0.0			1385		
WALNUTS	SHASTA	1800	0.0	4.1	3.8	0.0			1800		
WALNUTS	SOLANO	2985	0.0	2.3	2.0	0.0			2985		
WALNUTS	SONOMA	172	1.0	3.5	3.1	0.0			172		
WALNUTS	STANISLAUS	31700	153.5	5.8	5.4	0.0			31700		
WALNUTS	SUTTER	16030	0.0	3.8	3.5	0.0			16030		
WALNUTS	TEHAMA	12000	0.0	4.2	3.9	0.0			12000		
WALNUTS	TULARE	33000	68.0	6.5	5.9	0.0			33000		
WALNUTS	VENTURA	340	53.3	5.8	5.1	0.0			340		
WALNUTS	YOLO	9395	24.0	5.1	4.6	0.0			9395		
WALNUTS	YUBA	7645	0.0	3.8	3.5	0.0			7645		
	STATEWIDE	226005							226005		
	STATEWIDE/POTENTIAL								1.000		
WATERMELONS	IMPERIAL	35225	302.0	6.8	6.3	0.0			35225		
WATERMELONS	KERN	36200	28.0	5.3	4.9	0.0			36200		
WATERMELONS	KINGS	3864	13.0	5.4	5.1	0.0			3864		
WATERMELONS	MERCED	26900	181.0	6.4	5.9	0.0			26900		
WATERMELONS	RIVERSIDE	19141	637.0	7.4	6.8	0.0			19141		
WATERMELONS	SAN JOAQUIN	39200	57.0	5.5	5.0	0.0			39200		
WATERMELONS	STANISLAUS	11100	126.5	5.9	5.6	0.0			11100		
	STATEWIDE	171630							171630		
	STATEWIDE/POTENTIAL								1.000		
WHEAT	ALAMEDA	4105	9.0	3.7	3.0	0.0	0.7	19.8	4105	4136	5119
WHEAT	AMADOR	1260	8.0	4.8	4.6	0.0	2.1	34.7	1260	1288	1930
WHEAT	BUTTE	32000	0.0	2.7	2.5	0.0	0.1	3.5	32000	32026	33168
WHEAT	COLUSA	46200	0.0	2.7	2.5	0.0	0.1	3.5	46200	46237	47886
WHEAT	CONTRA COSTA	11000	2.0	3.1	2.5	0.0	0.3	11.0	11000	11035	12365
WHEAT	FRESNO	214000	67.5	5.8	5.3	0.0	4.3	46.1	214000	223636	397361
WHEAT	GLENN	47500	0.0	2.7	2.5	0.0	0.1	3.5	47500	47538	49234
WHEAT	IMPERIAL	363836	2.0	4.6	3.9	0.0	1.8	32.3	363836	370666	537683
WHEAT	KERN	117000	1.0	3.9	3.5	0.0	1.0	23.2	117000	118151	152372
WHEAT	KINGS	163161	3.0	4.0	3.7	0.0	1.0	24.1	163161	164875	214908

WHEAT	LAKE	480	0.0	3.4	3.2	0.0	0.5	15.1	480	482	566
WHEAT	LASSEN	2880	0.0	4.4	4.0	0.0	1.5	29.6	2880	2925	4091
WHEAT	LOS ANGELES	1037	104.0	5.0	4.8	0.0	2.6	37.7	1037	1065	1665
WHEAT	MADERA	88800	34.0	5.2	4.7	0.0	2.9	39.3	88800	91420	146406
WHEAT	MERCED	48200	9.0	4.0	3.6	0.0	1.0	23.9	48200	48701	63367
WHEAT	MODOC	5705	0.0	4.4	4.0	0.0	1.5	29.6	5705	5794	8103
WHEAT	MONTEREY	1760	0.0	3.2	2.8	0.0	0.3	11.9	1760	1766	1997
WHEAT	PLACER	1500	4.5	4.3	4.0	0.0	1.4	28.4	1500	1522	2095
WHEAT	RIVERSIDE	47871	358.0	6.0	5.3	0.0	4.8	47.9	47871	50279	91959
WHEAT	SACRAMENTO	48400	5.0	4.1	3.6	0.0	1.2	25.8	48400	48977	65210
WHEAT	SAN BENITO	4950	0.0	4.2	3.8	0.0	1.3	27.2	4950	5015	6796
WHEAT	SAN DIEGO	550	63.0	6.1	5.2	0.0	5.1	49.0	550	580	1079
WHEAT	SAN JOAQUIN	95400	0.0	3.4	3.0	0.0	0.5	15.9	95400	95907	113484
WHEAT	SAN LUIS OBISPO	11000	0.0	3.7	3.4	0.0	0.8	20.9	11000	11090	13900
WHEAT	SANTA BARBARA	5150	0.0	3.1	2.8	0.0	0.3	10.9	5150	5166	5778
WHEAT	SANTA CLARA	16000	0.0	4.2	3.8	0.0	1.3	27.2	16000	16211	21968
WHEAT	SHASTA	2300	0.0	3.5	3.2	0.0	0.6	17.4	2300	2314	2783
WHEAT	SISKIYOU	43672	0.0	4.4	4.0	0.0	1.5	29.6	43672	44354	62032
WHEAT	SOLANO	127400	0.0	1.9	1.5	0.0	-0.2	-13.0	127400	127400	127400
WHEAT	STANISLAUS	11400	9.0	4.0	3.6	0.0	1.0	23.9	11400	11518	14987
WHEAT	SUTTER	112690	0.0	2.7	2.5	0.0	0.1	3.5	112690	112780	116803
WHEAT	TEHAMA	14400	0.0	2.7	2.5	0.0	0.1	3.5	14400	14411	14926
WHEAT	TULARE	128000	1.0	4.8	4.2	0.0	2.2	35.1	128000	130878	197178
WHEAT	YOLO	163200	0.0	3.8	3.5	0.0	0.9	22.5	163200	164718	210544
WHEAT	YUBA	5218	0.0	2.7	2.5	0.0	0.1	3.5	5218	5222	5408
	STATEWIDE	1988025							1988025	2020083	2752551
	STATEWIDE/POTENTIAL								1.000	0.984	0.722
WHEAT-DRYLAND	ALAMEDA	3000	9.0	3.7	3.0	0.0	0.7	19.8	3000	3022	3741
WHEAT-DRYLAND	AMADOR	210	8.0	4.8	4.6	0.0	2.1	34.7	210	215	322
WHEAT-DRYLAND	BUTTE	18660	0.0	2.7	2.5	0.0	0.1	3.5	18660	18675	19341
WHEAT-DRYLAND	COLUSA	6270	0.0	2.7	2.5	0.0	0.1	3.5	6270	6275	6499
WHEAT-DRYLAND	CONTRA COSTA	1380	2.0	3.1	2.5	0.0	0.3	11.0	1380	1384	1551
WHEAT-DRYLAND	FRESNO	6750	67.5	5.8	5.3	0.0	4.3	46.1	6750	7054	12534
WHEAT-DRYLAND	GLENN	3810	0.0	2.7	2.5	0.0	0.1	3.5	3810	3813	3949
WHEAT-DRYLAND	IMPERIAL	2010	2.0	4.6	3.9	0.0	1.8	32.3	2010	2048	2970
WHEAT-DRYLAND	KERN	8190	1.0	3.9	3.5	0.0	1.0	23.2	8190	8271	10666
WHEAT-DRYLAND	KINGS	900	3.0	4.0	3.7	0.0	1.0	24.1	900	909	1185
WHEAT-DRYLAND	LAKE	540	0.0	3.4	3.2	0.0	0.5	15.1	540	543	636
WHEAT-DRYLAND	LASSEN	1860	0.0	4.4	4.0	0.0	1.5	29.6	1860	1889	2642
WHEAT-DRYLAND	MADERA	600	34.0	5.2	4.7	0.0	2.9	39.3	600	618	989
WHEAT-DRYLAND	MERCED	900	9.0	4.0	3.6	0.0	1.0	23.9	900	909	1183
WHEAT-DRYLAND	MODOC	2250	0.0	4.4	4.0	0.0	1.5	29.6	2250	2285	3196
WHEAT-DRYLAND	MONTEREY	240	0.0	3.2	2.9	0.0	0.4	12.7	240	241	275
WHEAT-DRYLAND	NAPA	240	0.0	3.0	2.5	0.0	0.3	9.3	240	241	265
WHEAT-DRYLAND	PLACER	330	4.5	4.3	4.0	0.0	1.4	28.4	330	335	461
WHEAT-DRYLAND	RIVERSIDE	4830	358.0	6.0	5.3	0.0	4.8	47.9	4830	5073	9278
WHEAT-DRYLAND	SACRAMENTO	9690	5.0	4.1	3.6	0.0	1.2	25.8	9690	9805	13055
WHEAT-DRYLAND	SAN BENITO	930	0.0	4.2	3.8	0.0	1.3	27.2	930	942	1277
WHEAT-DRYLAND	SAN BERNARDINO	750	335.3	5.8	5.3	0.0	4.5	46.8	750	785	1408
WHEAT-DRYLAND	SAN DIEGO	1200	63.0	6.1	5.2	0.0	5.1	49.0	1200	1264	2354
WHEAT-DRYLAND	SAN JOAQUIN	16200	0.0	3.4	3.0	0.0	0.5	15.9	16200	16286	19271
WHEAT-DRYLAND	SAN LUIS OBISPO	26730	0.0	3.7	3.4	0.0	0.8	20.9	26730	26949	33776
WHEAT-DRYLAND	SANTA BARBARA	3720	0.0	3.1	2.8	0.0	0.3	10.9	3720	3731	4174
WHEAT-DRYLAND	SANTA CLARA	330	0.0	4.2	3.8	0.0	1.3	27.2	330	334	453
WHEAT-DRYLAND	SHASTA	720	0.0	3.5	3.2	0.0	0.6	17.4	720	724	871
WHEAT-DRYLAND	SIERRA	180	8.0	4.8	4.6	0.0	2.1	34.7	180	184	276
WHEAT-DRYLAND	SISKIYOU	4410	0.0	4.4	4.0	0.0	1.5	29.6	4410	4479	6264
WHEAT-DRYLAND	SOLANO	9270	0.0	1.9	1.5	0.0	-0.2	-13.0	9270	9270	9270
WHEAT-DRYLAND	SONOMA	450	0.0	2.7	2.3	0.0	0.1	4.4	450	450	471

WHEAT-DR.__AND	STANISLAUS	1170	9.0	4.0	3.6	0.0	1.0	23.9	1170	1182	1538
WHEAT-DRYLAND	SUTTER	19950	0.0	2.7	2.5	0.0	0.1	3.5	19950	19966	20678
WHEAT-DRYLAND	TEHAMA	3690	0.0	2.7	2.5	0.0	0.1	3.5	3690	3693	3825
WHEAT-DRYLAND	TULARE	27840	1.0	4.8	4.2	0.0	2.2	35.1	27840	28466	42886
WHEAT-DRYLAND	YOLO	44280	0.0	3.8	3.5	0.0	0.9	22.5	44280	44692	57125
WHEAT-DRYLAND	YUBA	360	0.0	2.7	2.5	0.0	0.1	3.5	360	360	373
	STATEWIDE	234840							234840	237362	301028
	STATEWIDE/POTENTIAL								1.000	0.989	0.780
WHEAT-IRRIGATE	ALAMEDA	3180	9.0	3.7	3.0	0.0	0.7	19.8	3180	3204	3966
WHEAT-IRRIGATE	AMADOR	390	8.0	4.8	4.6	0.0	2.1	34.7	390	399	597
WHEAT-IRRIGATE	BUTTE	10140	0.0	2.7	2.5	0.0	0.1	3.5	10140	10148	10510
WHEAT-IRRIGATE	COLUSA	40530	0.0	2.7	2.5	0.0	0.1	3.5	40530	40562	42009
WHEAT-IRRIGATE	CONTRA COSTA	15840	2.0	3.1	2.5	0.0	0.3	11.0	15840	15890	17806
WHEAT-IRRIGATE	FRESNO	207000	67.5	5.8	5.3	0.0	4.3	46.1	207000	216320	384363
WHEAT-IRRIGATE	GLENN	43800	0.0	2.7	2.5	0.0	0.1	3.5	43800	43835	45399
WHEAT-IRRIGATE	IMPERIAL	429630	2.0	4.6	3.9	0.0	1.8	32.3	429630	437695	634915
WHEAT-IRRIGATE	KERN	118800	1.0	3.9	3.5	0.0	1.0	23.2	118800	119969	154716
WHEAT-IRRIGATE	KINGS	87300	3.0	4.0	3.7	0.0	1.0	24.1	87300	88217	114987
WHEAT-IRRIGATE	LASSEN	1200	0.0	4.4	4.0	0.0	1.5	29.6	1200	1219	1704
WHEAT-IRRIGATE	LOS ANGELES	2190	104.0	5.0	4.8	0.0	2.6	37.7	2190	2248	3517
WHEAT-IRRIGATE	MADERA	71490	34.0	5.2	4.7	0.0	2.9	39.3	71490	73600	117867
WHEAT-IRRIGATE	MERCED	47100	9.0	4.0	3.6	0.0	1.0	23.9	47100	47590	61921
WHEAT-IRRIGATE	MODOC	1830	0.0	4.4	4.0	0.0	1.5	29.6	1830	1859	2599
WHEAT-IRRIGATE	MONTEREY	3000	0.0	3.2	2.8	0.0	0.4	12.4	3000	3011	3424
WHEAT-IRRIGATE	NAPA	300	0.0	3.0	2.5	0.0	0.3	9.3	300	301	331
WHEAT-IRRIGATE	PLACER	690	4.5	4.3	4.0	0.0	1.4	28.4	690	700	964
WHEAT-IRRIGATE	RIVERSIDE	13920	358.0	6.0	5.3	0.0	4.8	47.9	13920	14620	26740
WHEAT-IRRIGATE	SACRAMENTO	51510	5.0	4.1	3.6	0.0	1.2	25.8	51510	52124	69400
WHEAT-IRRIGATE	SAN BENITO	1800	0.0	4.2	3.8	0.0	1.3	27.2	1800	1824	2471
WHEAT-IRRIGATE	SAN BERNARDINO	1650	335.3	5.8	5.3	0.0	4.5	46.8	1650	1727	3099
WHEAT-IRRIGATE	SAN JOAQUIN	96600	5.0	5.6	5.1	0.0	3.8	43.9	96600	100377	172076
WHEAT-IRRIGATE	SAN LUIS OBISPO	8100	0.0	3.7	3.4	0.0	0.8	20.9	8100	8166	10235
WHEAT-IRRIGATE	SANTA BARBARA	2580	0.0	3.1	2.8	0.0	0.3	10.9	2580	2588	2895
WHEAT-IRRIGATE	SANTA CLARA	1920	0.0	4.2	3.8	0.0	1.3	27.2	1920	1945	2636
WHEAT-IRRIGATE	SHASTA	1830	0.0	3.5	3.2	0.0	0.6	17.4	1830	1841	2214
WHEAT-IRRIGATE	SISKIYOU	11040	0.0	4.4	4.0	0.0	1.5	29.6	11040	11212	15681
WHEAT-IRRIGATE	SOLANO	31770	0.0	1.9	1.5	0.0	-0.2	-13.0	31770	31770	31770
WHEAT-IRRIGATE	STANISLAUS	13110	9.0	4.0	3.6	0.0	1.0	23.9	13110	13246	17235
WHEAT-IRRIGATE	SUTTER	119880	0.0	2.7	2.5	0.0	0.1	3.5	119880	119976	124256
WHEAT-IRRIGATE	TEHAMA	10710	0.0	2.7	2.5	0.0	0.1	3.5	10710	10719	11101
WHEAT-IRRIGATE	TULARE	76500	1.0	4.8	4.2	0.0	2.2	35.1	76500	78220	117845
WHEAT-IRRIGATE	YOLO	88320	0.0	3.8	3.5	0.0	0.9	22.5	88320	89142	113941
WHEAT-IRRIGATE	YUBA	4710	0.0	2.7	2.5	0.0	0.1	3.5	4710	4714	4882
	STATEWIDE	1620360							1620360	1650978	2330072
	STATEWIDE/POTENTIAL								1.000	0.981	0.695

Appendix C

Maps of Patterns for hours x pphm > 10 pphm, 7 hr, and 12 hr Ozone Concentrations Across California

Data for the June - August 1984 growing season was used to construct isopleth maps of ozone concentrations across California. The maps were drawn by hand but gave a rough idea patterns of ozone concentrations across the state. The three month ozone concentrations were calculated for the three "doses" used for crop-loss equations, i.e. hours x pphm for hrs > 10 pphm, 7 hour 0900-1559 average, and 12 hour 0800-1959 average. The averages were calculated for all 136 sites in California with data during the June - August period. The isopleths were drawn around sites with similar ozone concentration, recognizing that little ozone data was available for large areas of the state, especially the northern and eastern mountain and desert areas, and mid-San Joaquin Valley. Dots on the maps represent ozone air monitoring sites.

Figure C-1 indicates the pattern of 12 hour ozone averages across the state. Each isopleth represents an upward bound in concentration, e.g. everything to the left outside of the 3 pphm line has a concentration between 2.0 and 2.9 pphm, and everything to the right outside of the 5 pphm line has a concentration between 4.0 and 4.9 pphm ozone.

Averages were less than 2 pphm in the San Francisco-Oakland area, likely due to the cleansing effect of on-shore coastal winds. Averages were between 2 and 2.9 pphm for coastal areas ranging from Ukiah in the north to Santa Maria in the south, and reaching inland to Vaccaville in the Sacramento River Delta area. Averages between 3.0 and 3.9 pphm occurred further inland ranging from Lakeport in the north to Meadowview Road in Sacramento County, to Nipomo in the south. Coastal areas in Santa Barbara, Los Angeles, Orange, and San Diego counties also had averages between 3.0 and 3.9 pphm. There also were ozone averages between 3.0 and 3.9 pphm for Burney and Chico in the north.

The rest of the state had 12 hour ozone averages greater or equal to 4.0 pphm. The 4.0 to 4.9 pphm concentrations occurred in mountain areas of northern California and the west side of the San Joaquin valley and Delta areas. The 4.0 to 4.9 pphm averages also occurred in a near coastal

FIGURE C -1

CALIFORNIA STATEWIDE

OZONE CONCENTRATIONS

1984 JUNE - AUGUST

12 HR AVERAGE IN PPHM

--- 2.0 - 2.9

--- 3.0 - 3.9

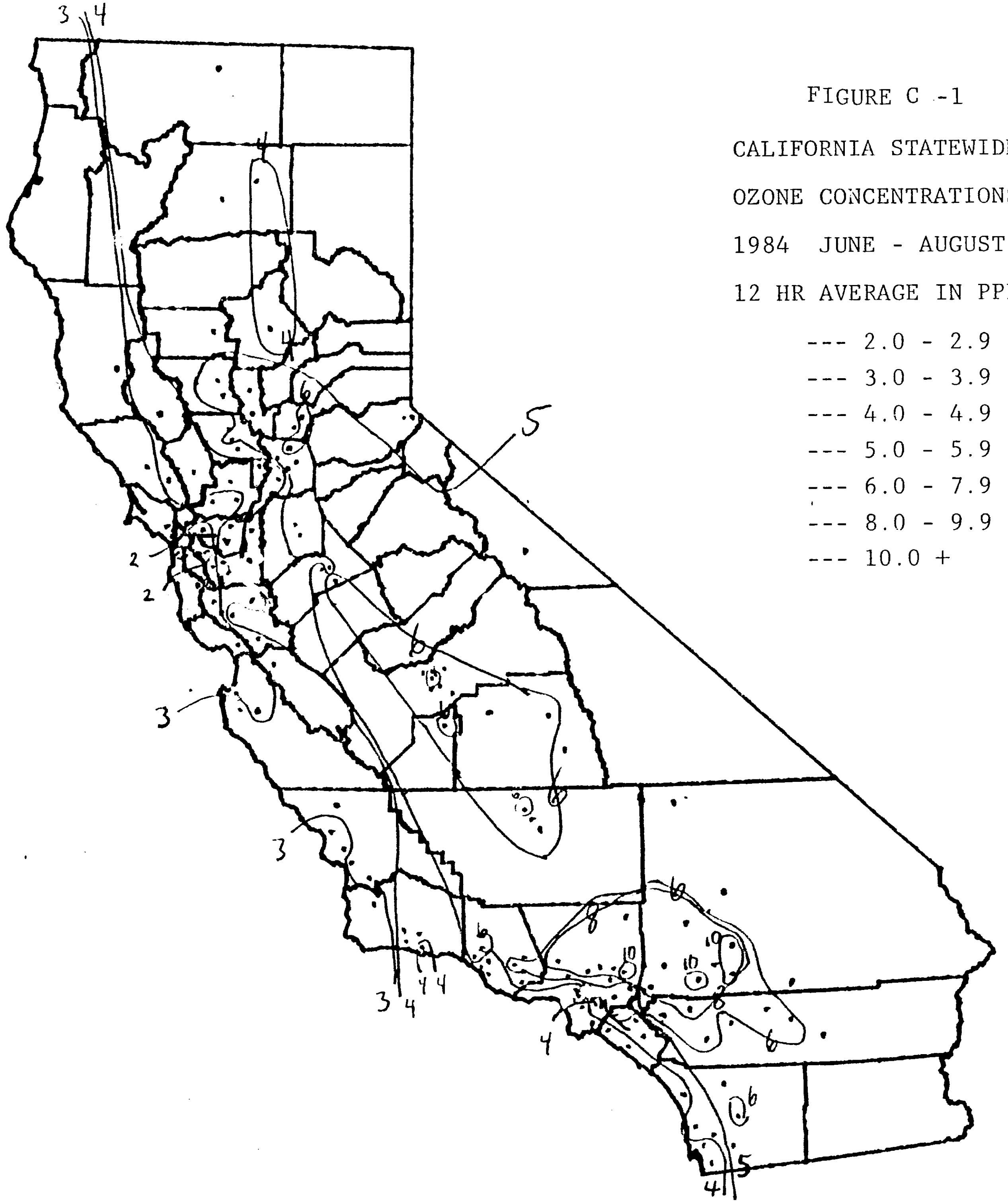
--- 4.0 - 4.9

--- 5.0 - 5.9

--- 6.0 - 7.9

--- 8.0 - 9.9

--- 10.0 +



belt of southern California from Santa Barbara county, through Ventura, Los Angeles, and Orange counties, ending in San Diego County. There was an average of 4.3 pphm ozone in downtown Fresno in the south. The depression in ozone in downtown Fresno was particularly noticeable in terms of peak values as described later for the hours x pphm > 10 pphm dose. Twelve hour averages of greater than 5.0 pphm occurred in all of the rest of state from the east side of the Sacramento Valley, to the San Joaquin Valley, across all of the eastern Mountain and desert areas, and down to the South Coast air basin. The occurrence of high 12 hour values greater than 4.0 or 5.0 for rural sites such as Redding, Yreka, Mammoth Lakes, and Trona indicated that background ozone concentrations may be higher at high altitude sites than low altitude sites. Thus, even though losses to crops from ozone may be significant in these areas, the losses are not associated with anthropomorphic activities and would not be reduced with stricter air quality standards.

Concentrations greater than 6.0 pphm occurred in conjunction with urbanized areas and at higher elevations in the mountains. Concentrations of 6.0 to 7.9 pphm occurred to the east-northeast of Sacramento, and in a broad swath of the San Joaquin Valley from the Modesto area, through the Fresno area, to the Bakersfield area. A concentration of 6.0 to 7.9 pphm also occurred in Sequioa National Park, but this was not based on the full June-August period.

The highest 12 hour ozone concentrations occurred in inland valleys and mountain areas of the South Coast Air Basin. The concentrations were between 6.0 and 7.9 pphm for a band of sites from eastern Ventura county, through the middle of Los Angeles county, and as far east of Palm Springs. Ozone concentrations between 8.0 and 9.9 pphm occurred in inland valleys surrounding the San Gabriel and San Bernadino Mountains. The area included sites from Newhall in the San Fernando Valley to Redlands in the San Bernadino Valley on the south side of the mountains, as well as Victorville and Lancaster on the north side of the mountains. There were four sites in the South Coast Air Basin with 12 hour averages greater > 10 pphm, with the highest average (11.5 pphm) occurring at Lake Gregory in the San Bernadino Mountains.

Figure C-2 indicates the pattern of 7 hour ozone averages across the state. The isopleth lines follow a pattern similar to that for the 12 hour averages, except that in the same geographic area the lines indicate approximately 1.0 pphm higher ozone averages. The highest 7 hour ozone concentrations were again in the South Coast Air Basin, with the highest average the 13.9 pphm at Glendora.

Figure C-3 indicates the pattern of hours x pphm > 10 pphm doses across the state. There were no hours with ozone concentrations greater than 10 pphm for coastal areas, northern and eastern mountain areas, or the north and west portions of the Sacramento Valley. The 10 pphm dose was less than 100 for most of the rest of state except for areas near the cities of Sacramento, Stockton, Modesto, Fresno, and Bakersfield in the Central Valley; and a large area near Los Angeles. The Central Valley cities had 10 pphm doses of from 100 to a maximum of 210 northeast of Sacramento.

The highest hours x pphm > 10 pphm doses were in the inland valleys and mountains of the South Coast Air Basin, where at 13 sites the dose was greater than 1000. The highest doses were greater than 2500 and occurred at five sites in San Bernadino county, with the highest dose of 3561 occurring at Lake Gregory.

California could be divided into roughly five geographical areas based on the pattern of ozone concentrations for the 12 hour and 7 hour averages, and hours x pphm > 10 pphm dose during the growing season:

1) Coastal areas which ranged from Del Norte county in the north to San Diego county in the south. These areas were characterized by 12 or 7 hour ozone averages of less than 4.0 pphm, and no hours with ozone averages greater than 10 pphm. Some sites in the coastal areas in Los Angeles, Orange, and San Diego counties had 12 or 7 hour averages a little greater than 4 pphm, but still had no hourly values greater than 10 pphm.

2) Mountain and high desert areas which were from Siskiyou county in the north, across eastern California to San Bernadino county in the south. These areas were characterized by 12 or 7 hour averages of 4 to 5 pphm or greater, but few hours with concentrations greater than 10 pphm. There may have been effects from urban related ozone in some areas such as the southern Sierra Nevada mountains, but these were not associated with a large number of hours with concentrations greater than 10 pphm, even with a 7 hour average as high as the 7.3 pphm at Sequioa National Park.

FIGURE C -2

CALIFORNIA STATEWIDE
OZONE CONCENTRATIONS
1984 JUNE - AUGUST
7 HR AVERAGE IN PPHM

--- 2.0 - 2.9
--- 3.0 - 3.9
--- 4.0 - 4.9
--- 5.0 - 5.9
--- 6.0 - 7.9
--- 8.0 - 9.9
--- 10 +

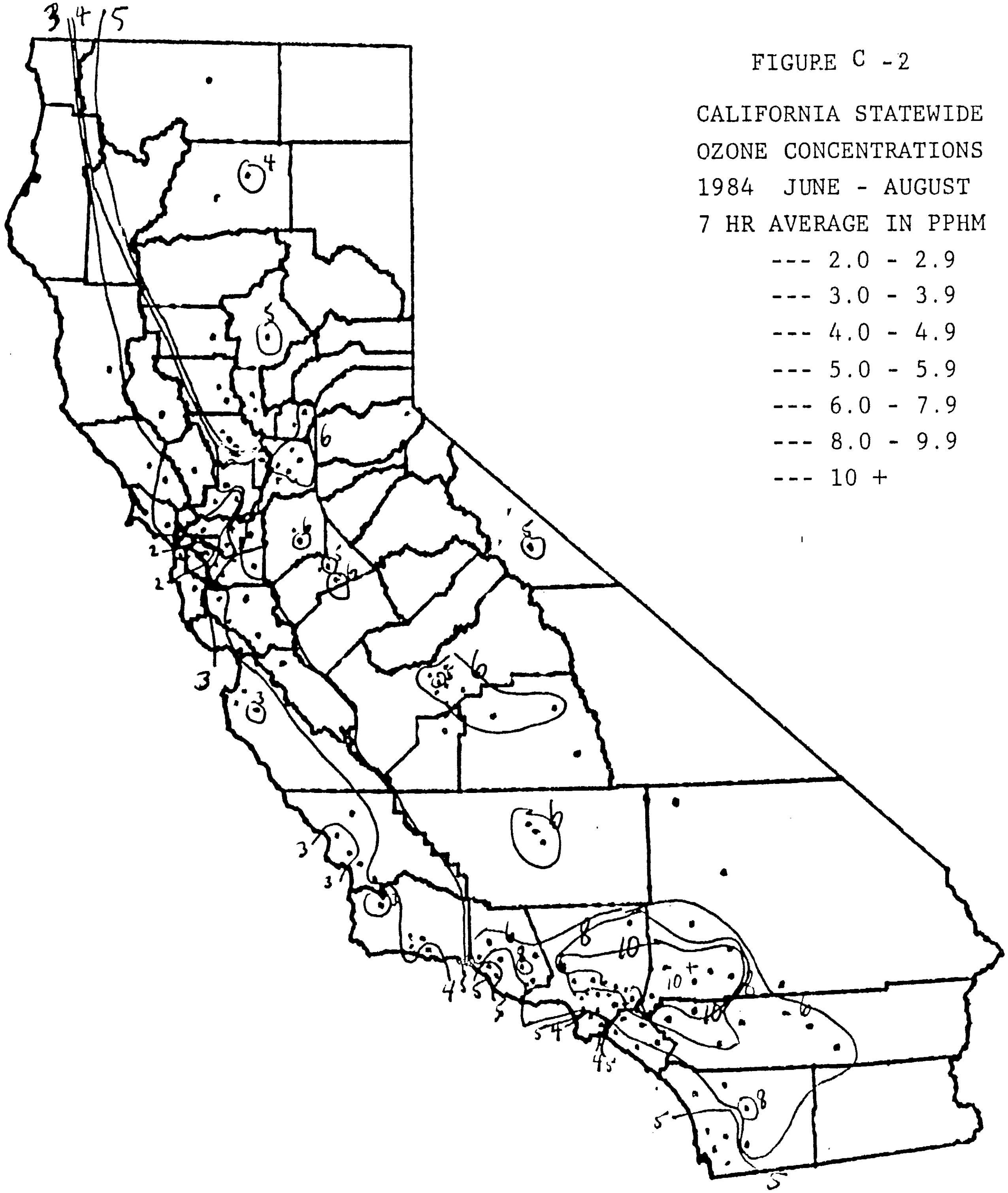
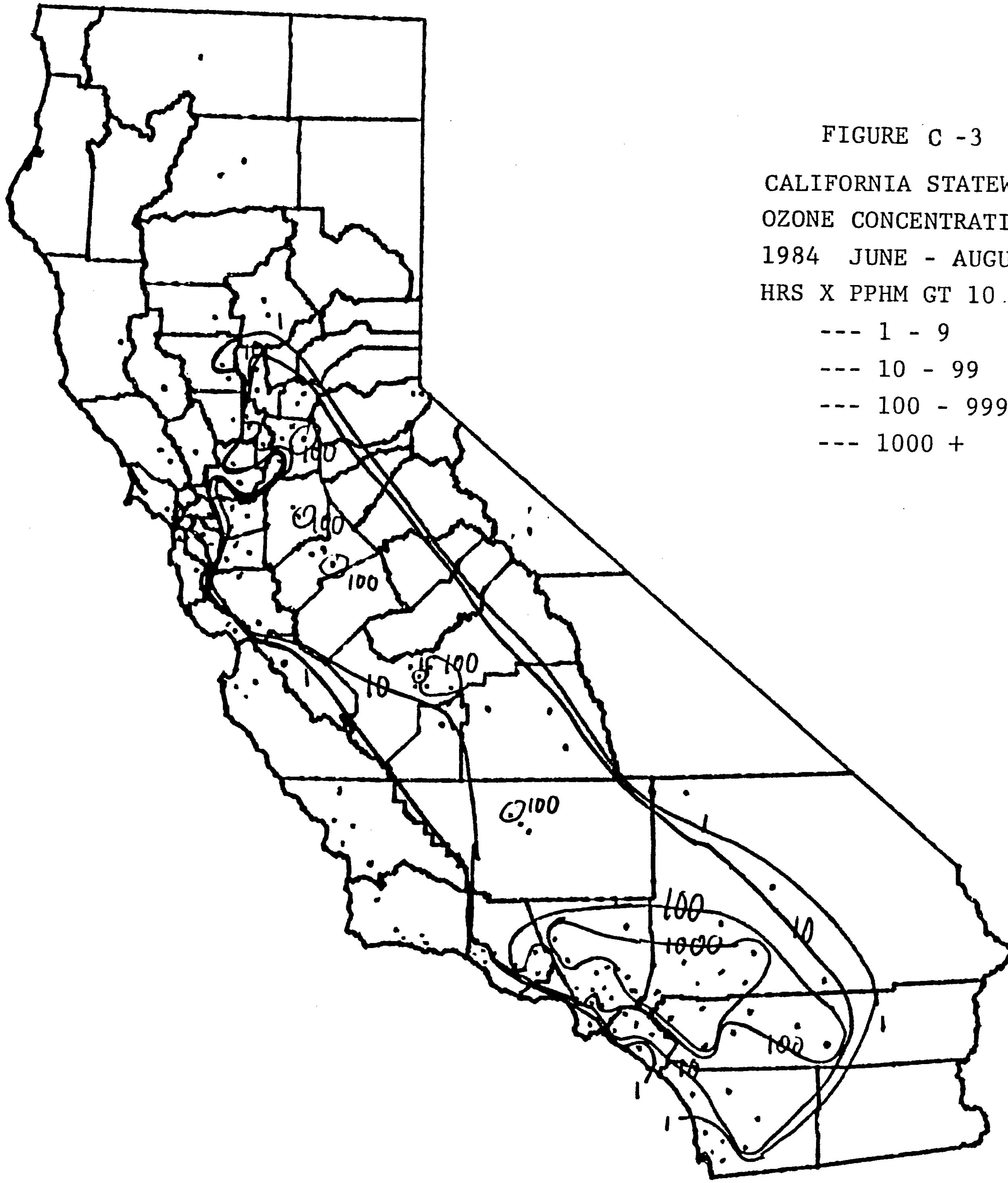


FIGURE C -3

CALIFORNIA STATEWIDE
OZONE CONCENTRATIONS
1984 JUNE - AUGUST
HRS X PPHM GT 10 PPHM

--- 1 - 9
--- 10 - 99
--- 100 - 999
--- 1000 +



3) Sacramento Valley counties which ranged from Shasta in the north to Solano in the south. This area was characterized by 12 and 7 hour ozone averages of 3.0 to 5.0 pphm, but few hours with ozone concentrations greater than 10 pphm except in the Sacramento area. East and northeast of Sacramento, 12 and 7 hour ozone averages were greater than 6.0 pphm, and the hours x pphm > 10 pphm dose was as great as 210 depending on the air monitoring site.

4) San Joaquin Valley counties which ranged from San Joaquin county in the north to Kern county in the south. This area was characterized by 12 and 7 hour averages greater than 5 pphm, and hours x pphm > 10 pphm doses of over 100 for many sites. There were increased 12 and 7 hour averages and 10 pphm doses in the vicinity of Fresno and Bakersfield, but decreased ozone concentrations near the center of both cities. The ozone concentrations were especially low in the center of Fresno where the 12 hour average was 4.3 pphm, and hours x pphm > 10 pphm dose was 18, compared to 12 hour averages of up to 7.1 pphm and 10 pphm doses of up to 180 for surrounding sites.

5) Portions of southern California counties away from the coast including parts of Ventura, Los Angeles, Orange, San Diego, San Bernadino, and Riverside counties. These areas had 12 and 7 hour ozone averages of 6 to 13 pphm, increasing with distance from the coast and altitude. The hours x pphm > 10 pphm doses also were very high many sites in this area, especially in eastern Los Angeles and southwestern San Bernadino counties.

APPENDIX D

California Air Resources Board
Crop Loss Assessment Project

Mini-workshop

June 4-5, 1986

Agenda

Overview -	Wednesday, 1900-1930
Crop and Air Monitoring Data bases -	Thursday, 0800-1000
Preliminary Assessments -	Thursday, 1000-1200
Recommendations -	Thursday, 1300-1500

California Air Resources Board
June 4-5, 1986

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